

FIG. 1

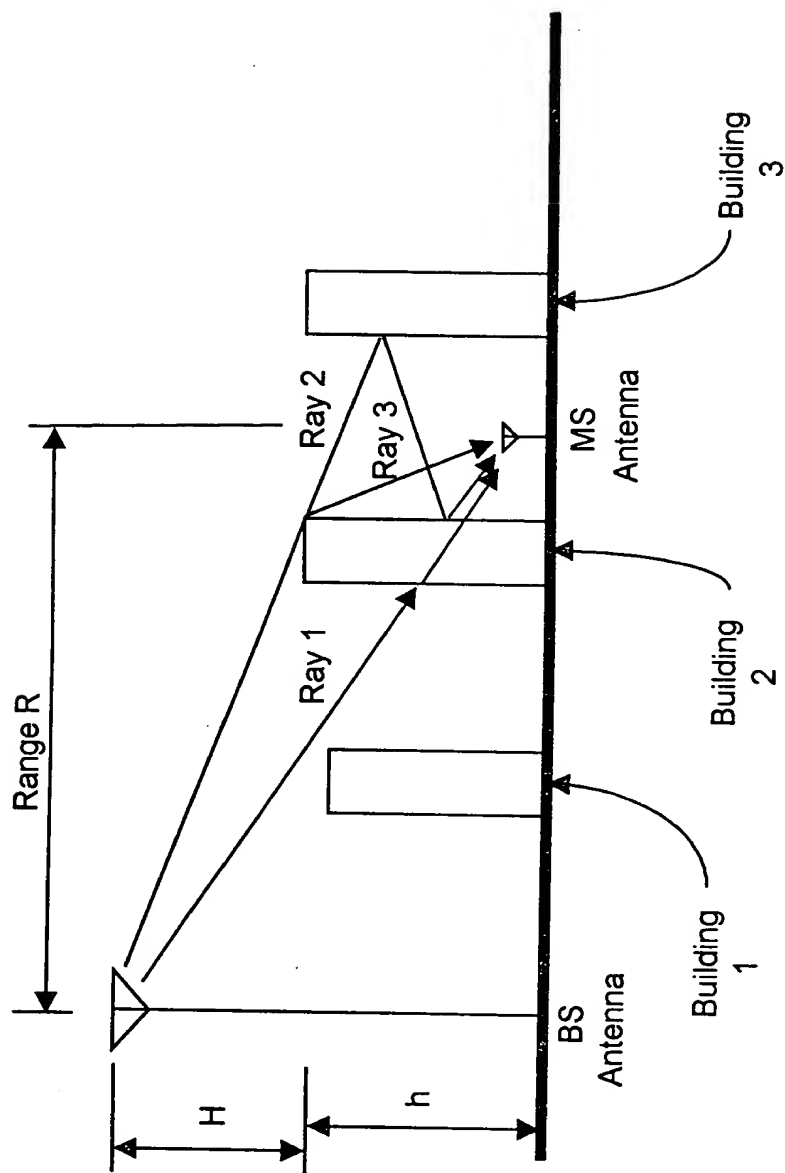


FIG. 2

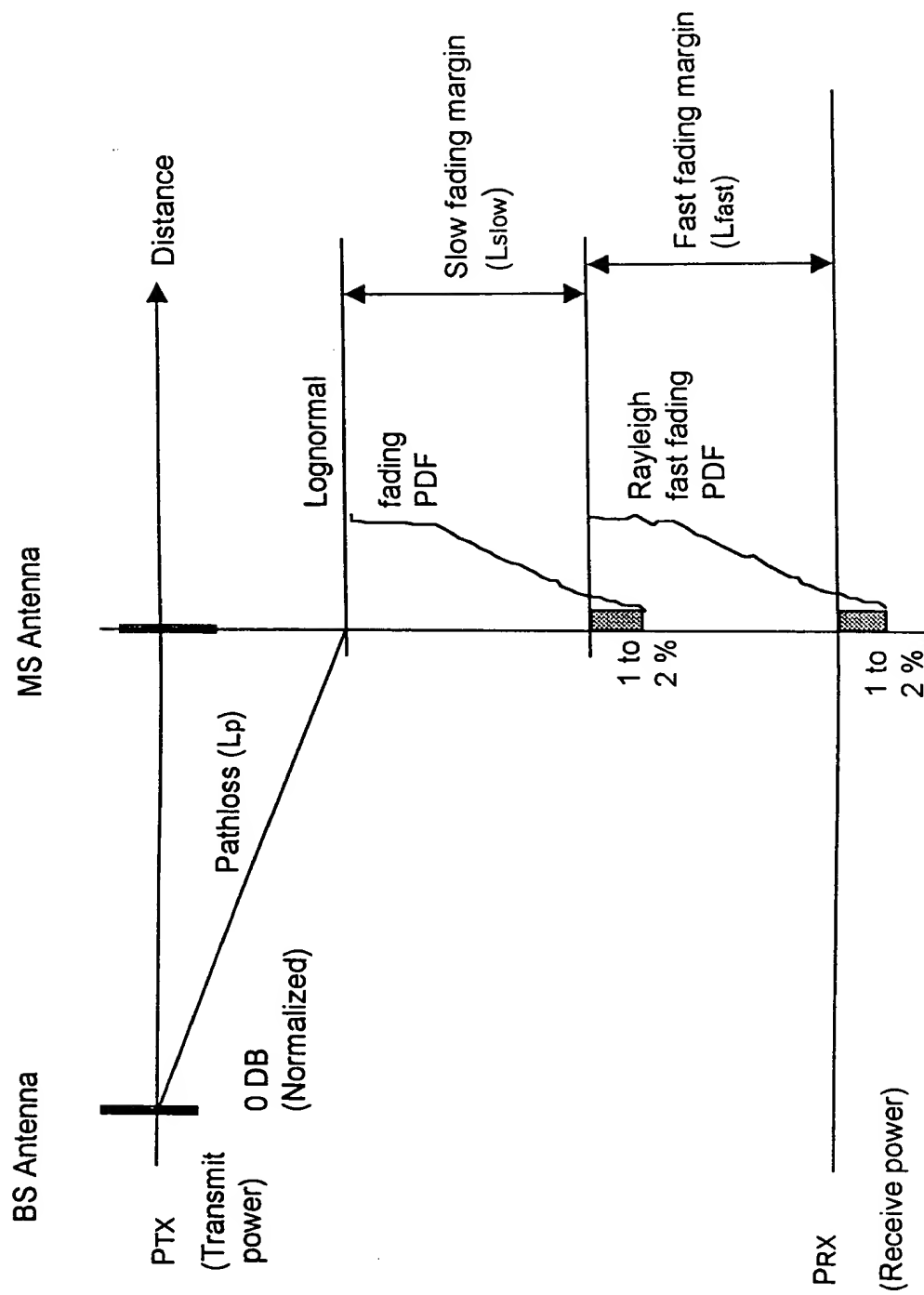


FIG. 3

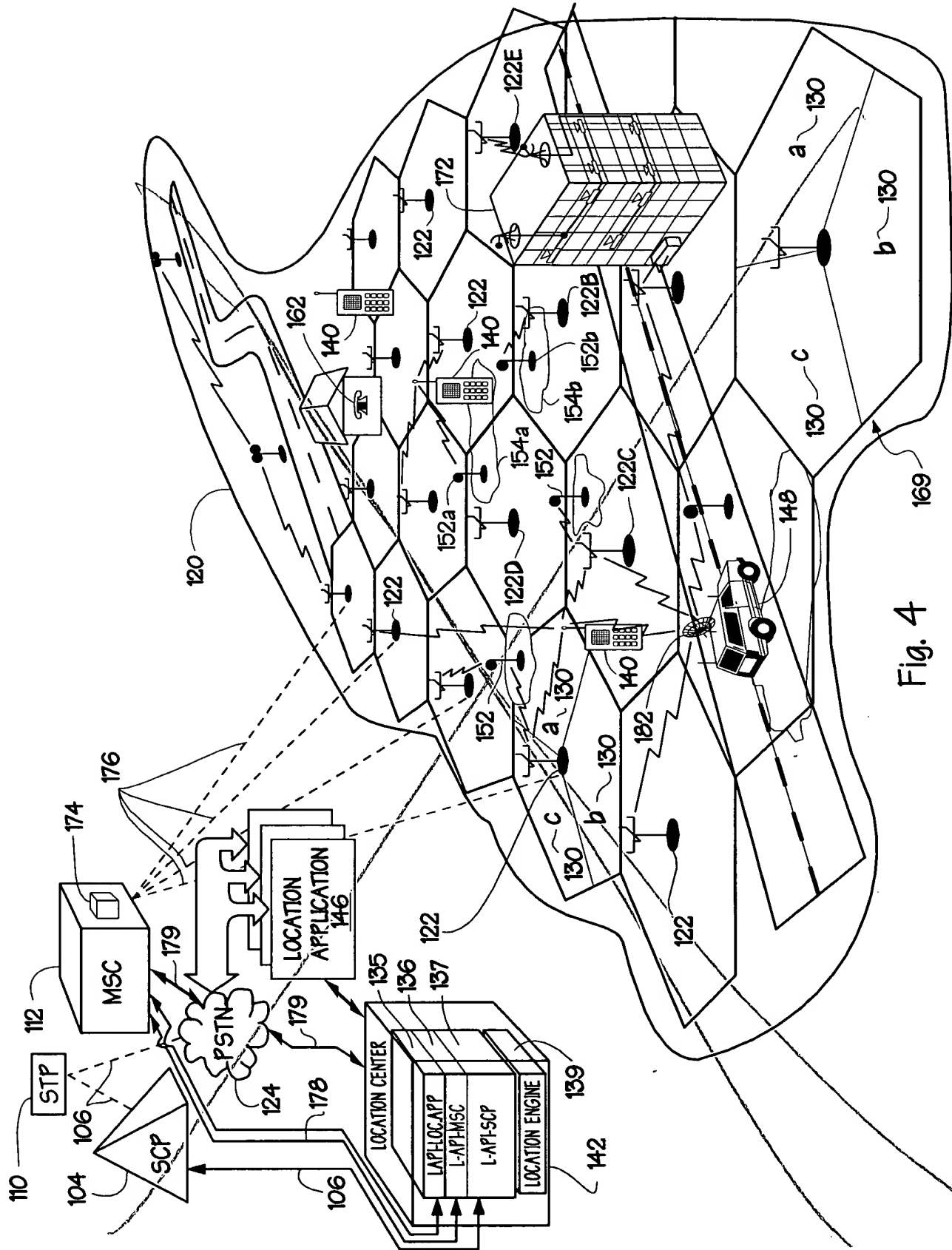


Fig. 4

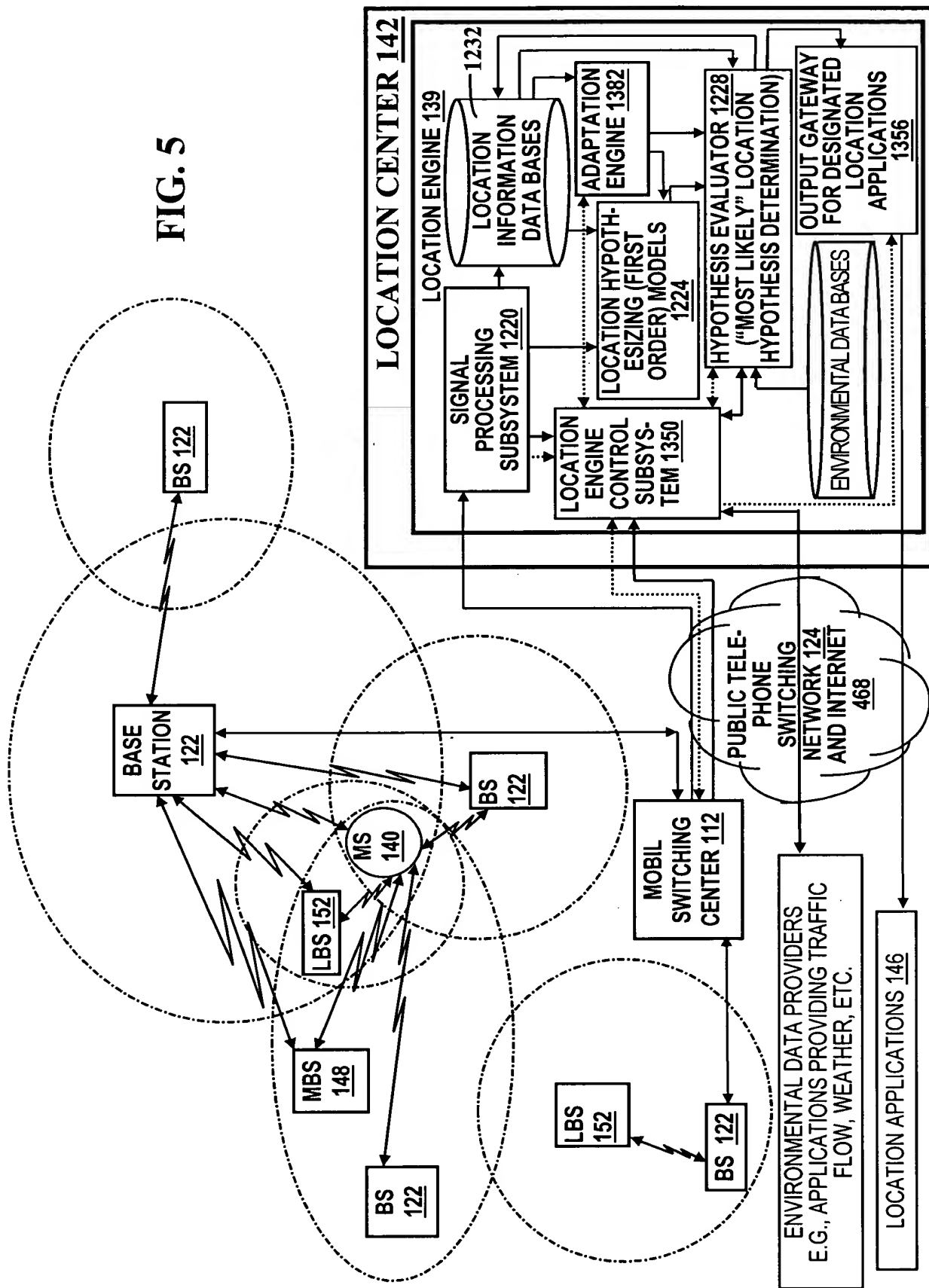


Fig. 6(1)

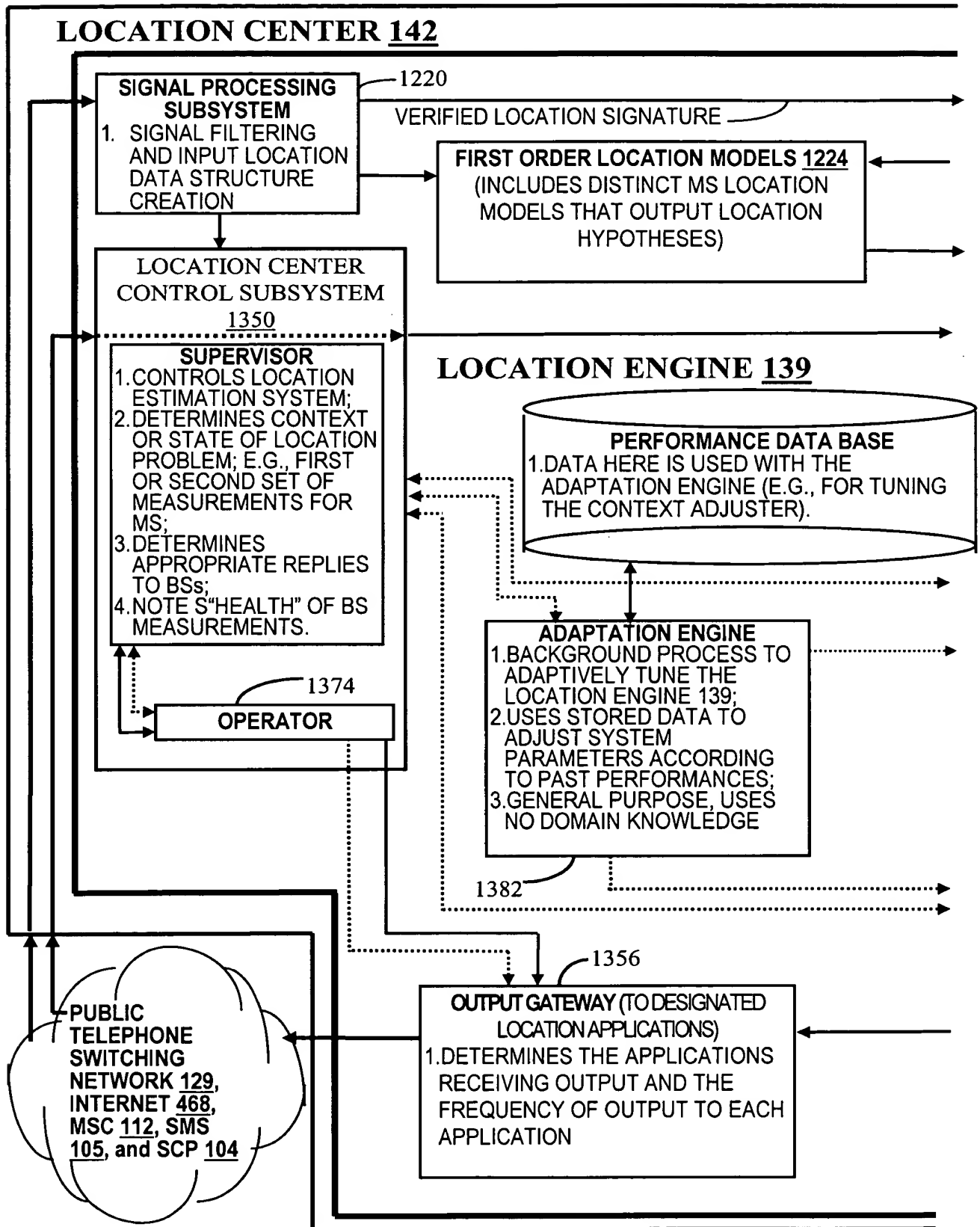


FIG 6(2)

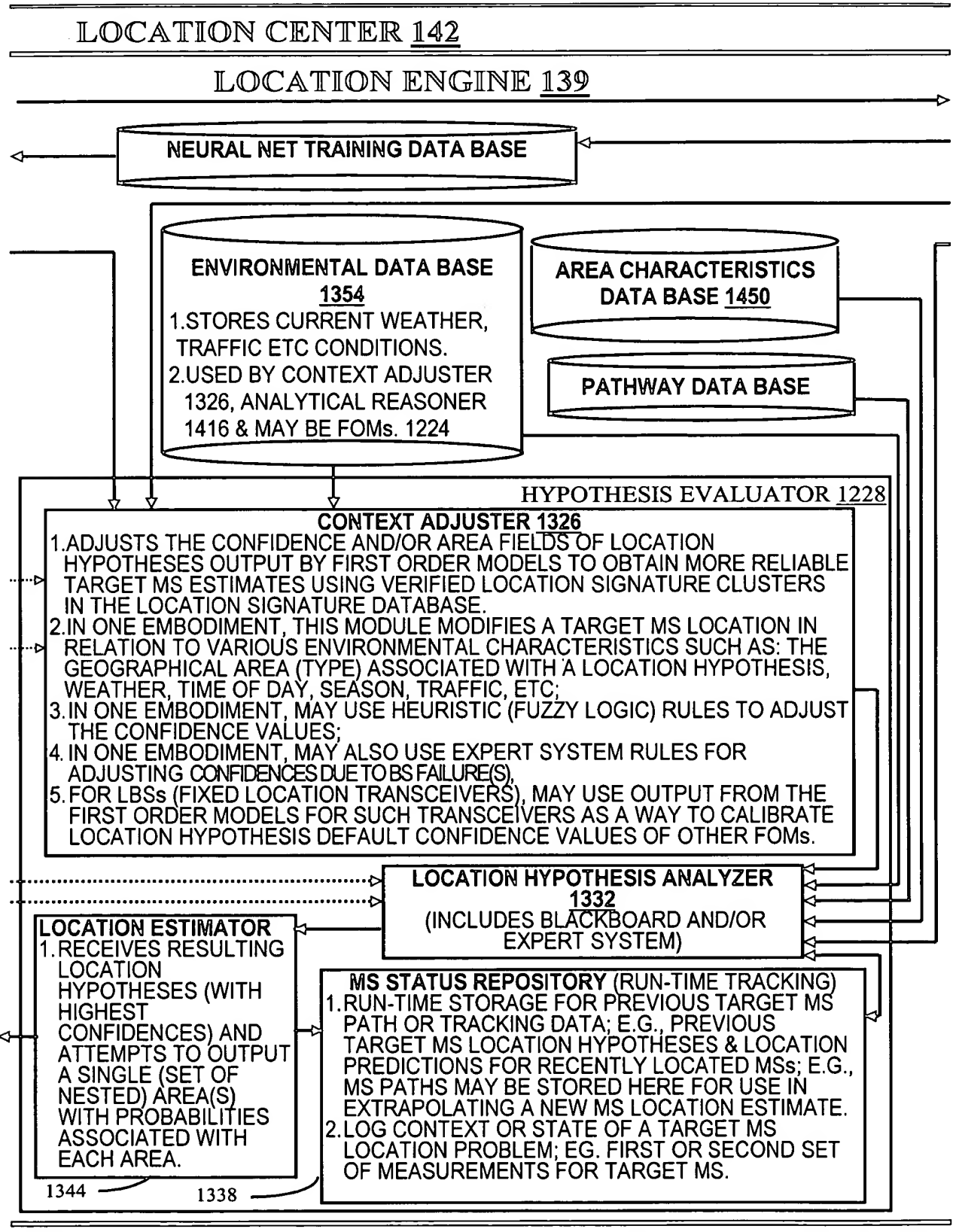
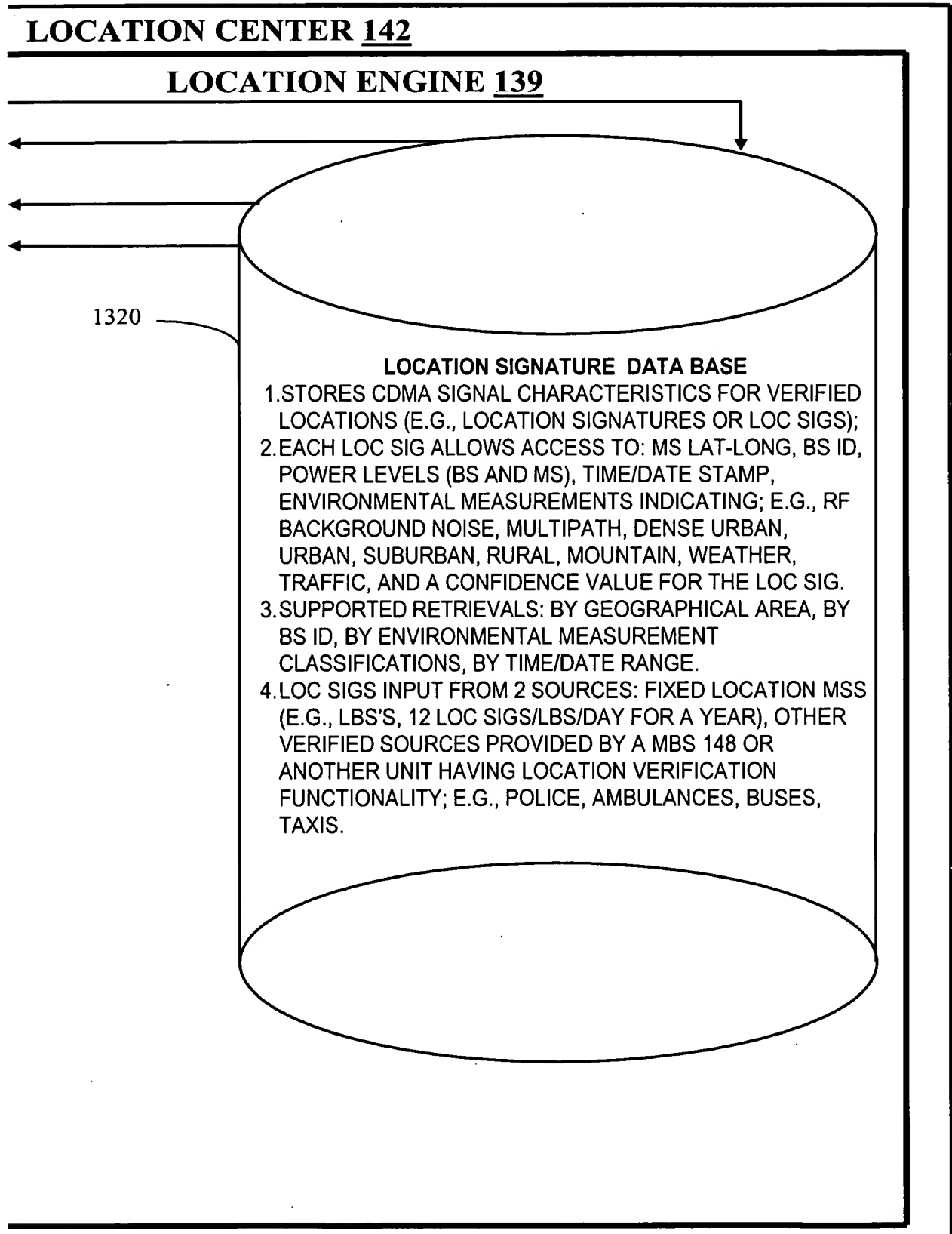
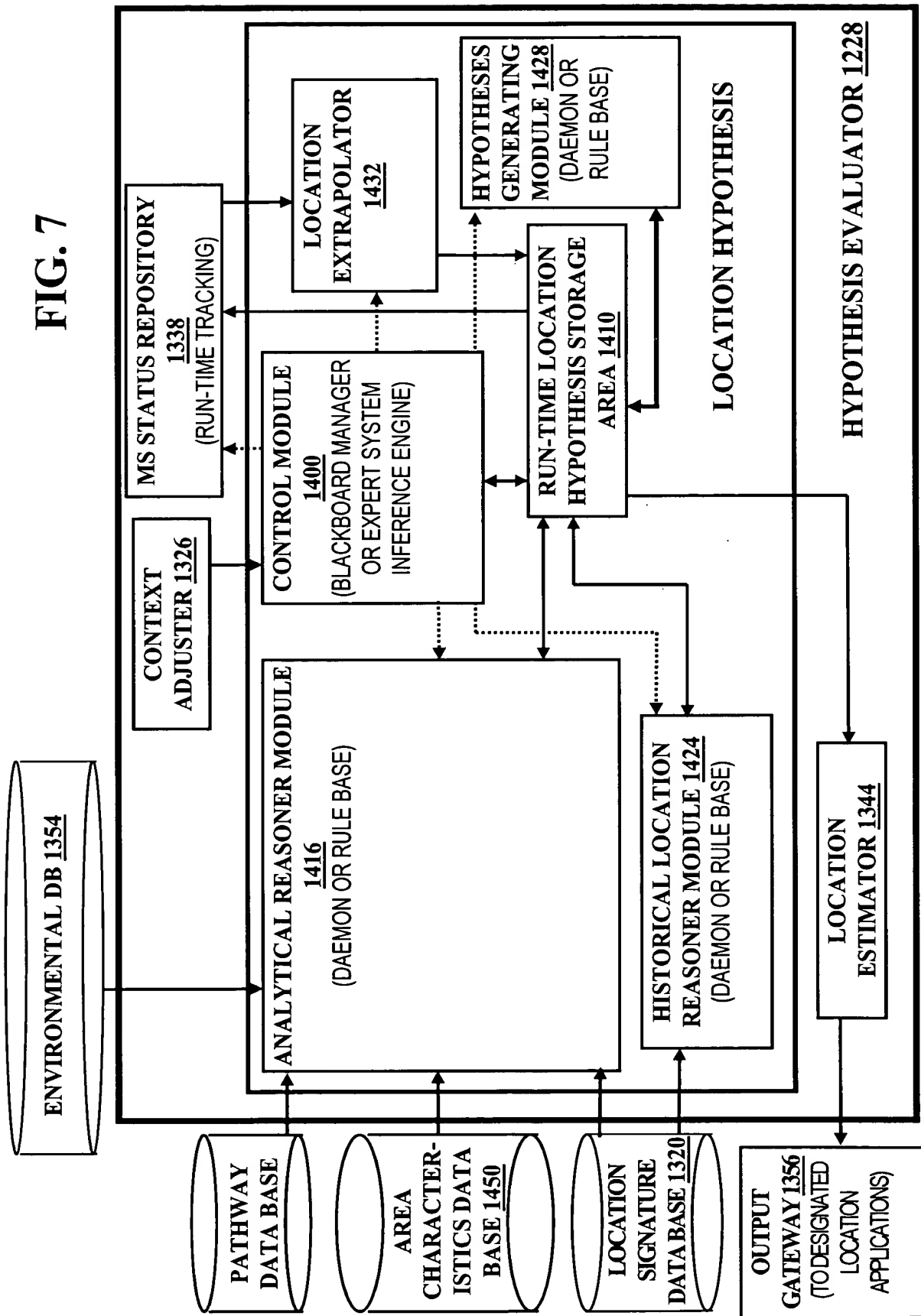


FIG 6(3)





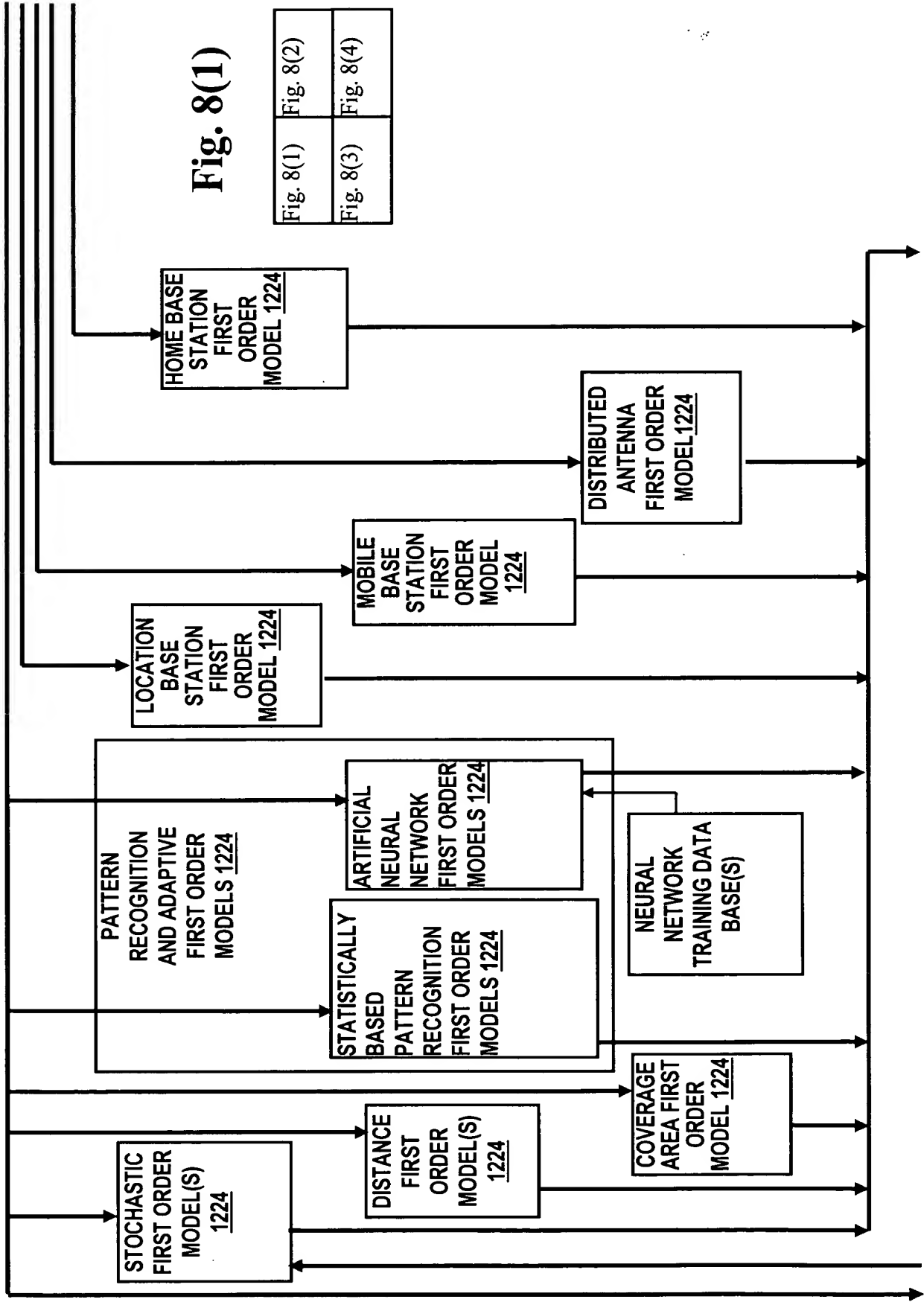


Fig. 8(1)

| | |
|-----------|-----------|
| Fig. 8(1) | Fig. 8(2) |
| Fig. 8(3) | Fig. 8(4) |

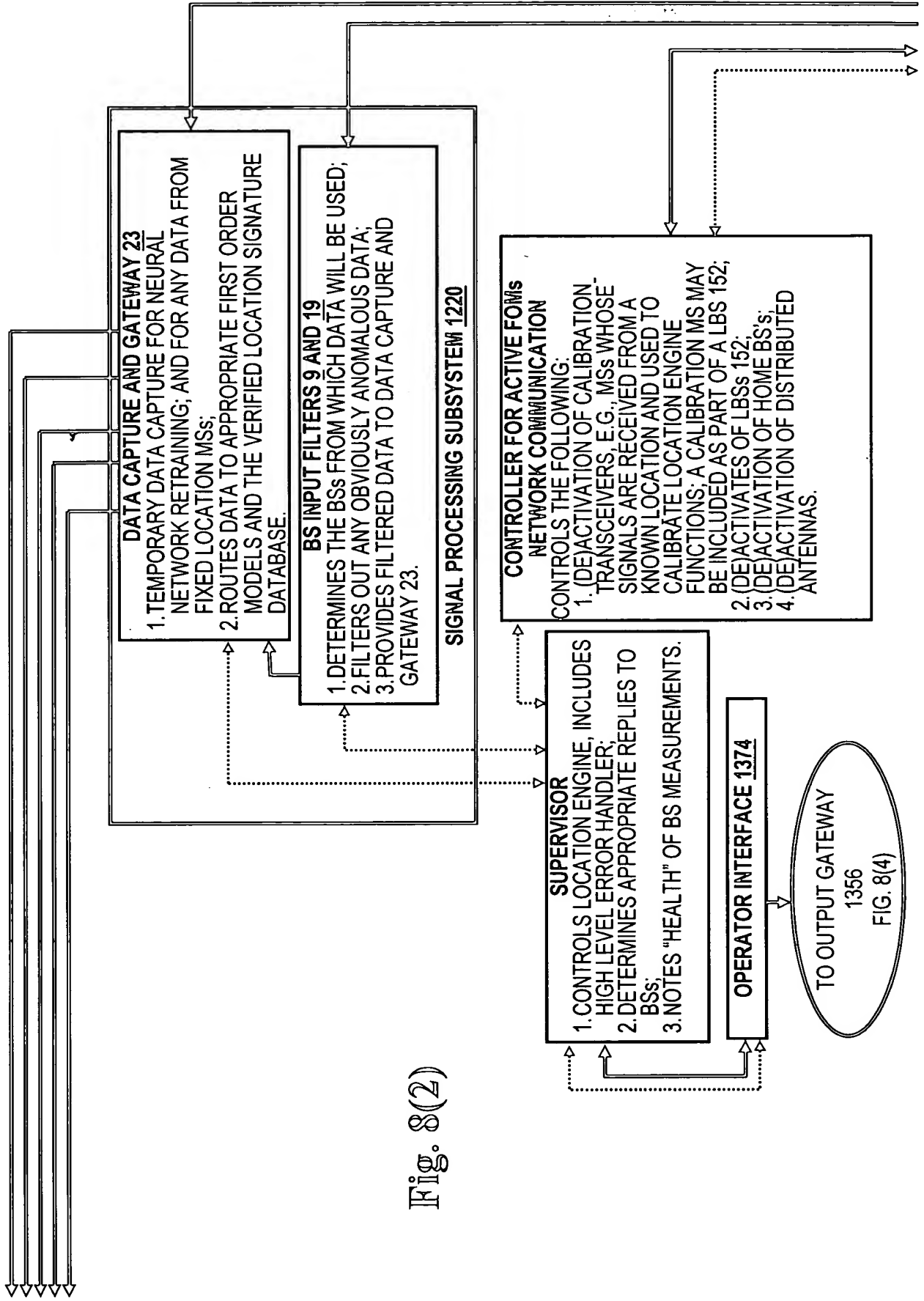
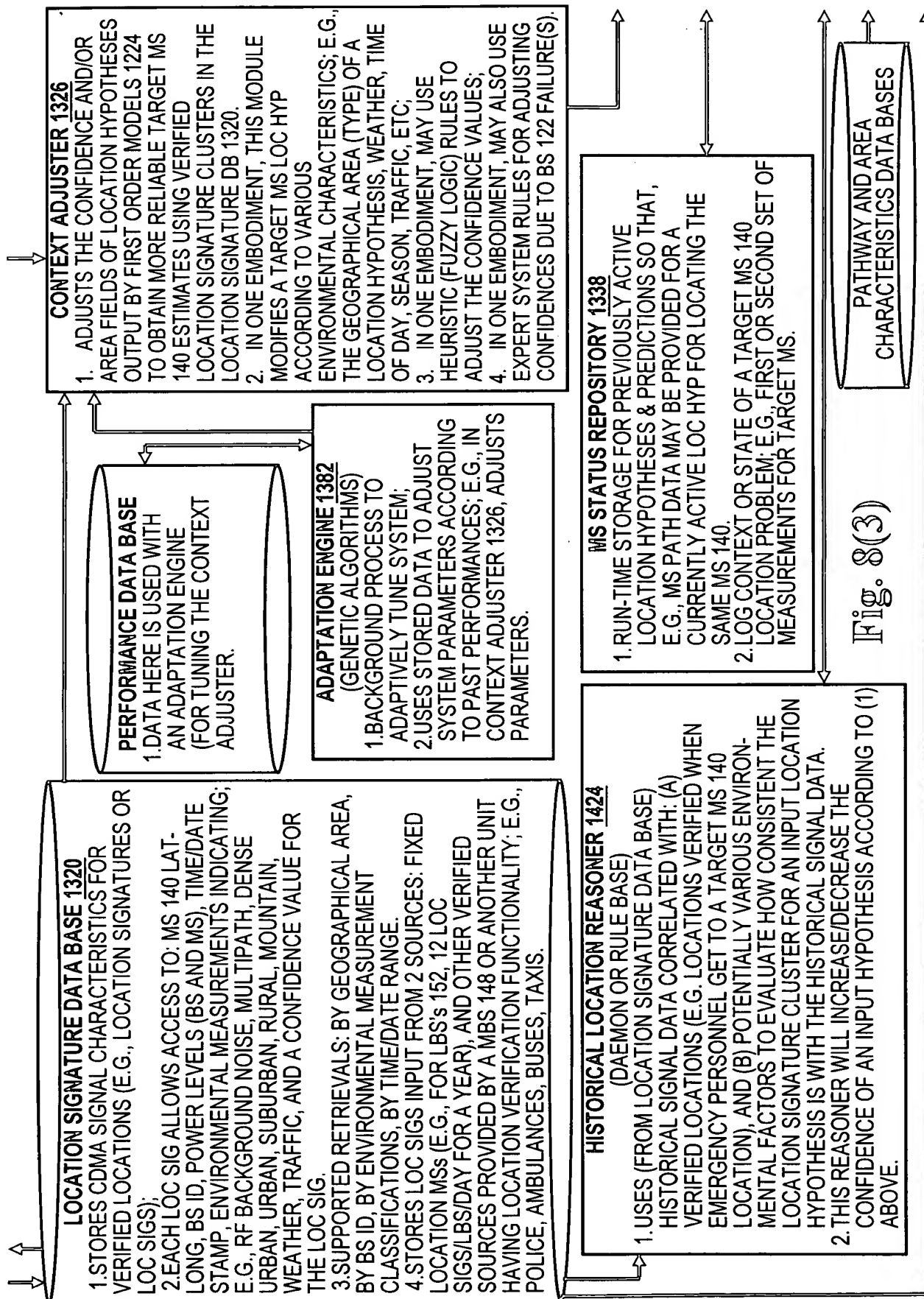


Fig. 8(2)



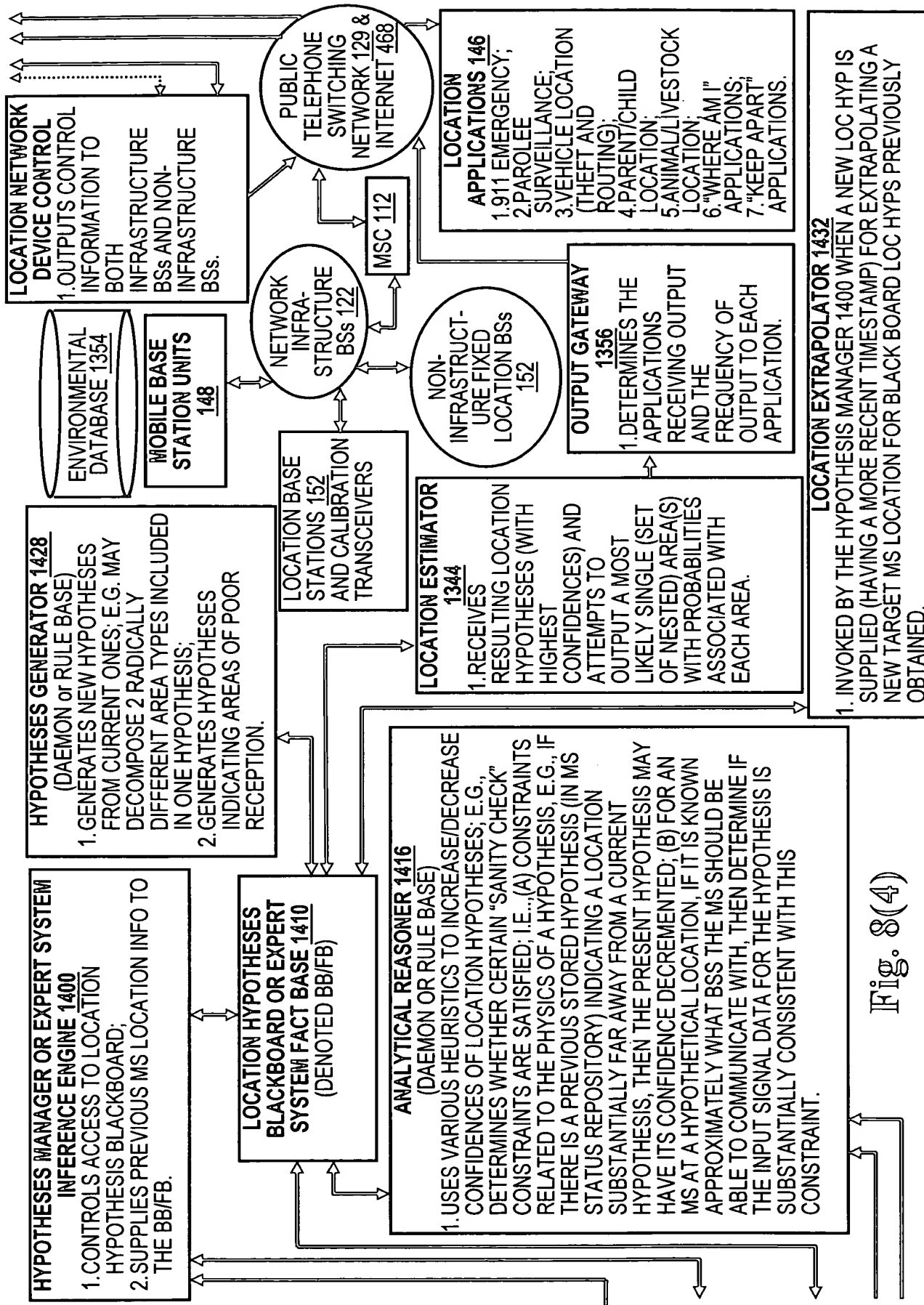


Fig. 8(4)

FOM_ID: First Order Model ID (providing this Location Hypothesis); note, since it is possible for location hypotheses to be generated by other than the FOM's, in general this field identifies the module that generated this location hypothesis.

MS_ID: The identification of the target MS to which this location hypothesis applies.

pt_est: The most likely location point estimate of the target MS

valid_pt: Boolean indicating the validity of "pt_est"

area_est: Location Area Estimate of the target MS provided by the FOM. This area estimate will be used whenever "image_area" below is NULL.

valid_area: Boolean indicating the validity of "area_est" (one of "pt_est" and "area_est" must be valid).

adjust: Boolean (true iff adjustments to the fields of this location hypothesis are to be performed in the Context Adjuster Module).

pt_covering: reference to a substantially minimal area (e.g., mesh cell) covering of "pt_est". Note, since this MS may be substantially on a cell boundary, this covering may in some cases include more than one cell.

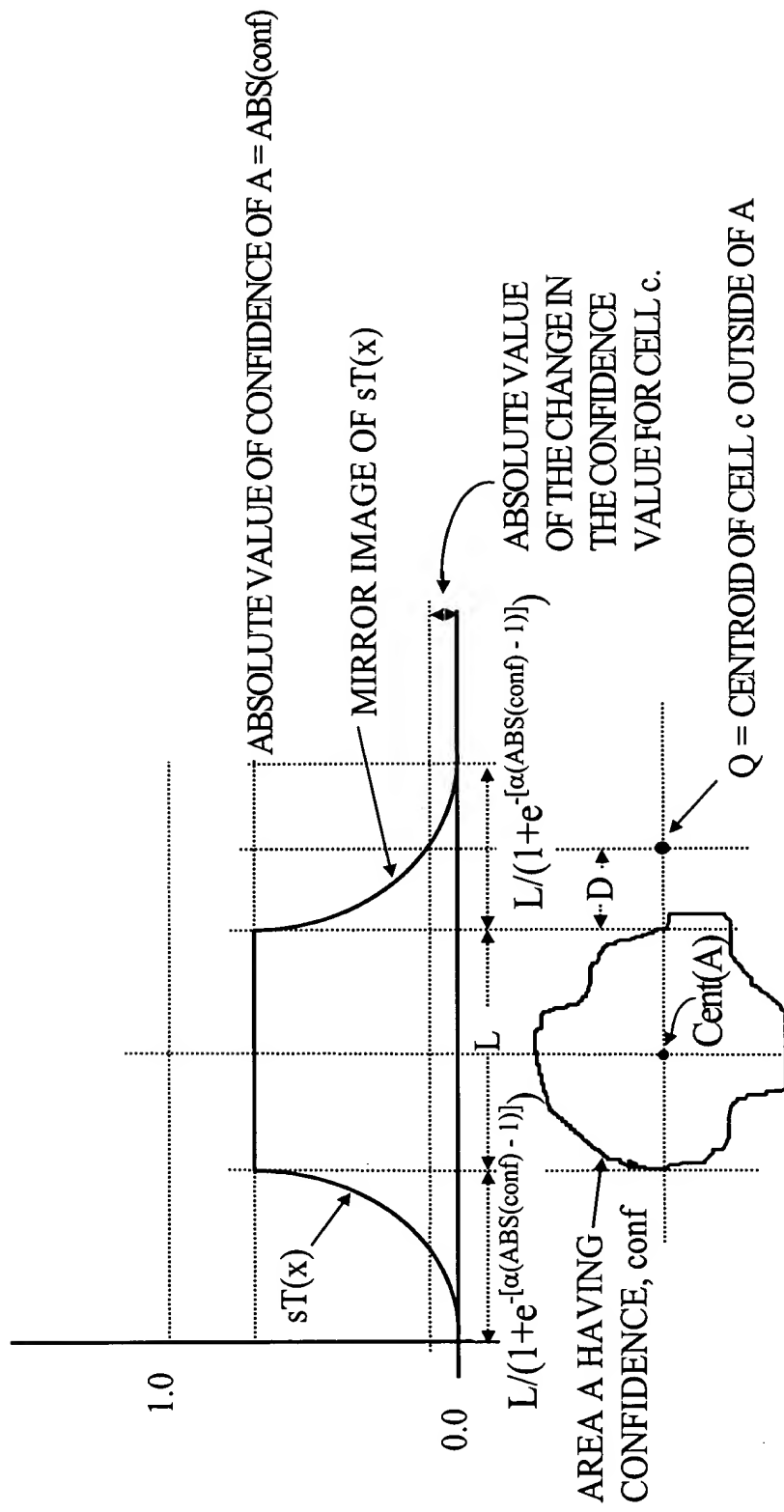
image_area: reference to an area (e.g., mesh cell) covering of the image cluster set area for "pt_covering" (see detailed description of the function, "confidence_adjuster"). Note that if this field is not NULL, then this is the target MS location estimate used by the Location Center instead of "area_est".

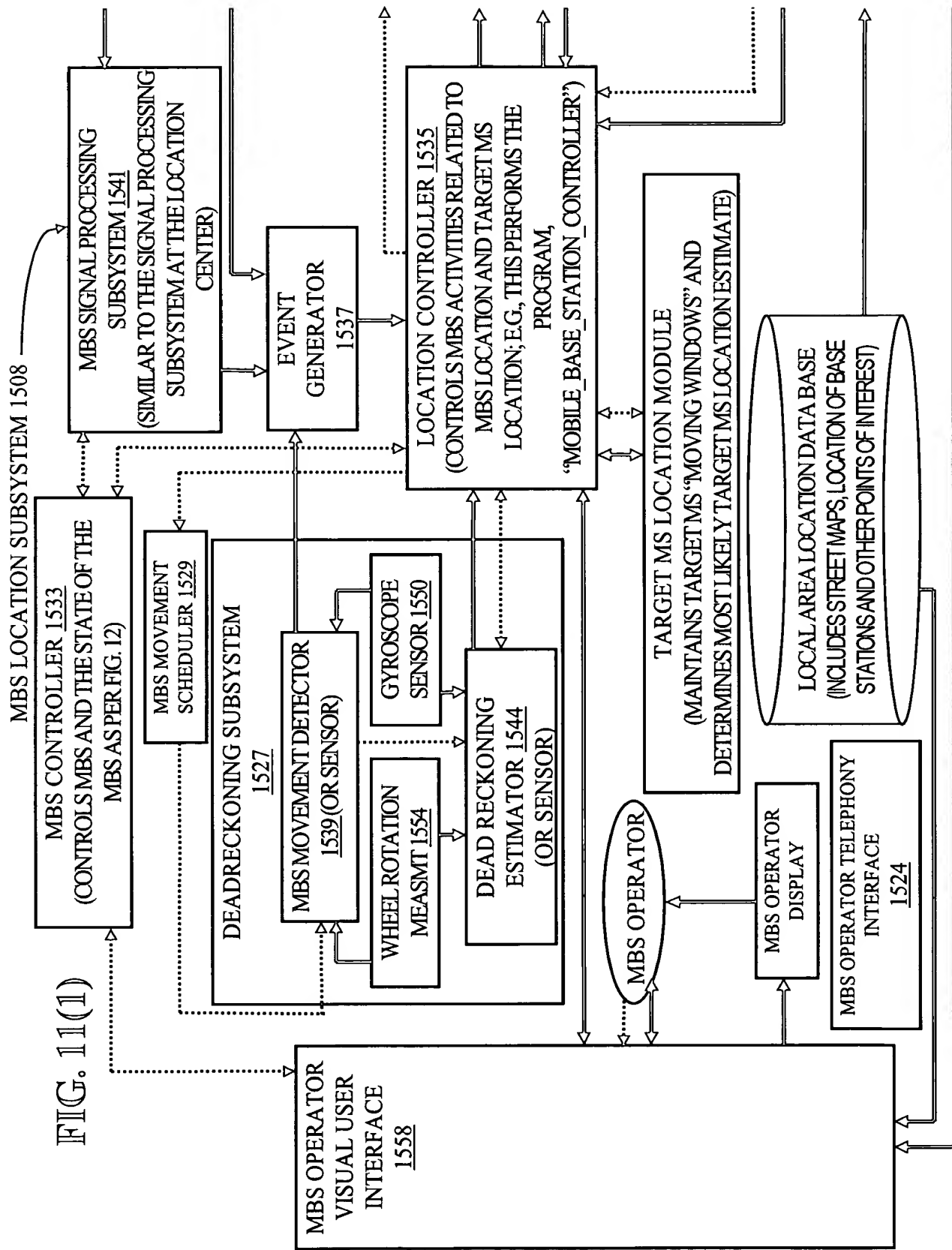
FIG. 9A

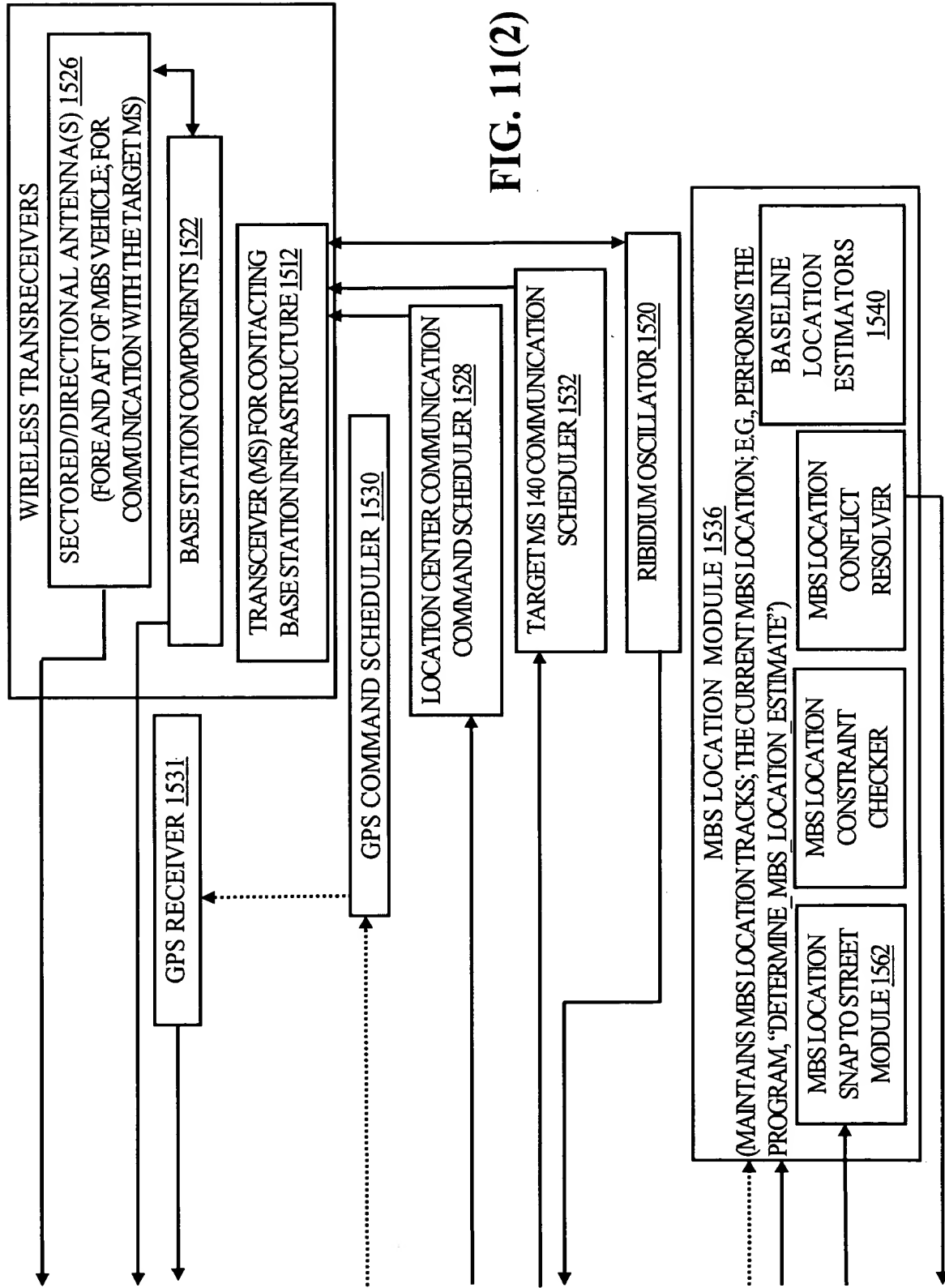
| | |
|--|--|
| <p><i>extrapolation_area</i>: reference to (if non-NULL) an extrapolated MS target estimate area provided by the Location Extrapolator submodule of the Hypothesis Analyzer. That is, this field, if non_NULL, is an extrapolation of the “image_area” field if it exists, otherwise this field is an extrapolation of the “area_est” field. Note other extrapolation fields may also be provided depending on the embodiment of the present invention, such as an extrapolation of the “pt_covering”.</p> <p><i>confidence</i>: A real value in the range [-1.0, +1.0] indicating a likelihood that the target MS is in (or out) of a particular area. If positive: if “image_area” exists, then this is a measure of the likelihood that the target MS is within the area represented by “image_area,” else if “image_area” has not been computed (e.g., “adjust” is FALSE), then “area_est” must be valid and this is a measure of the likelihood that the target MS is within the area represented by “area_est.” If negative, then “area_est” must be valid and this is a measure of the likelihood that the target MS is NOT in the area represented by “area_est”. If it is zero (near zero), then the likelihood is unknown.</p> <p><i>Original_Timestamp</i>: Date and time that the location signature cluster for this location hypothesis was received by the CDMA Filter Subsystem,</p> <p><i>Active_Timestamp</i>: Run-time field providing the time to which this location hypothesis has had its MS location estimate(s) extrapolated (in the Location Extrapolator of the Hypothesis Analyzer). Note that this field is initialized with the value from the “Original_Timestamp” field.</p> <p><i>Processing Tags and environmental categorizations</i>: For indicating particular types of environmental classifications not readily determined by the Original_Timestamp field (e.g., weather, traffic), and restrictions on location hypothesis processing.</p> <p><i>loc_sig_cluster</i>: Access to location signature signal characteristics provided to the First Order Models by the CDMA Filter Subsystem; i.e., access to the “loc_sigs” (received at “timestamp” regarding the location of the target MS)</p> <p><i>descriptor</i>: Optional descriptor (from the First Order Model indicating why/how the Location Area Estimate and Confidence Value were determined).</p> | |
|--|--|

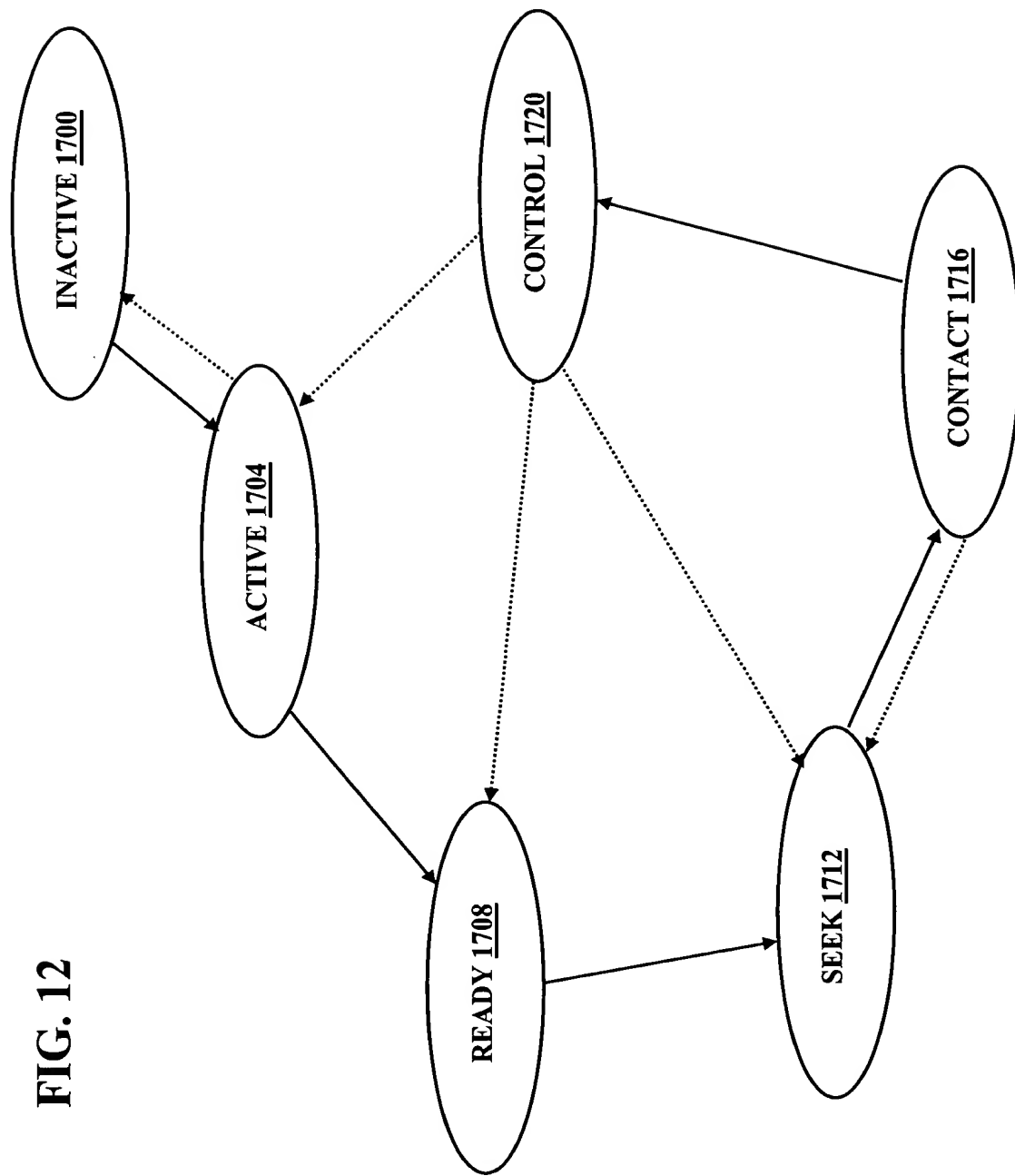
FIG. 9B

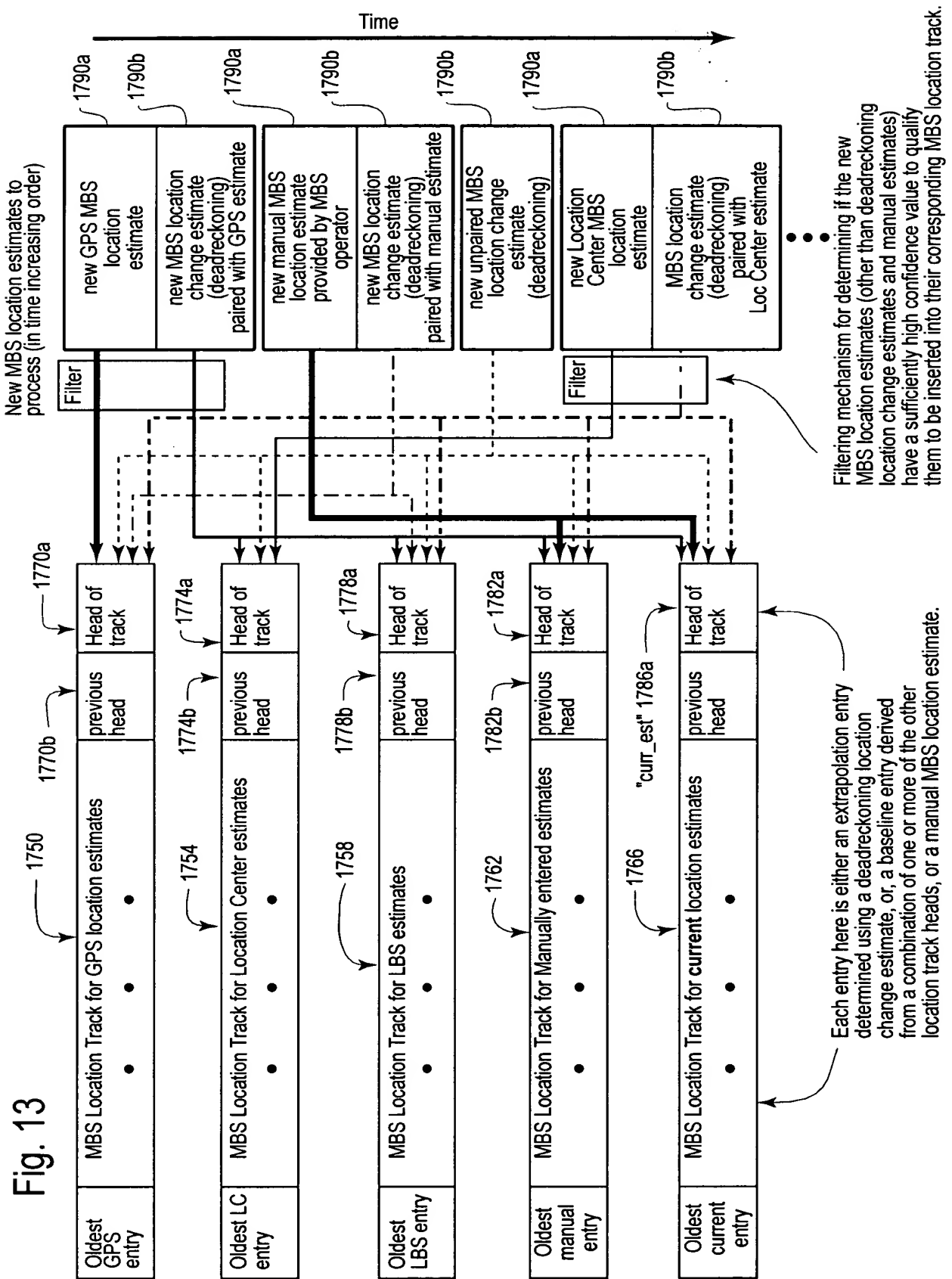
FIG. 10











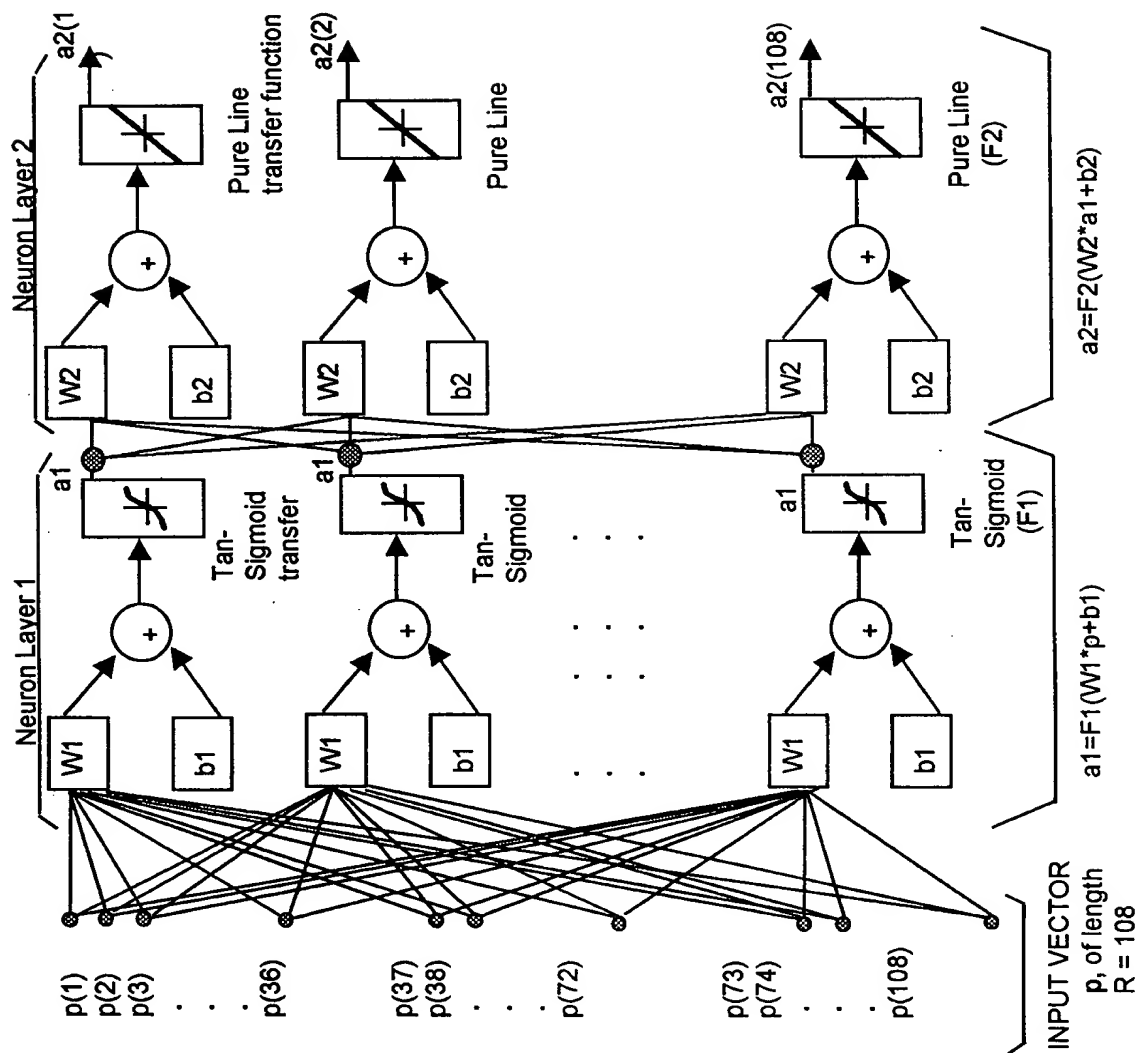
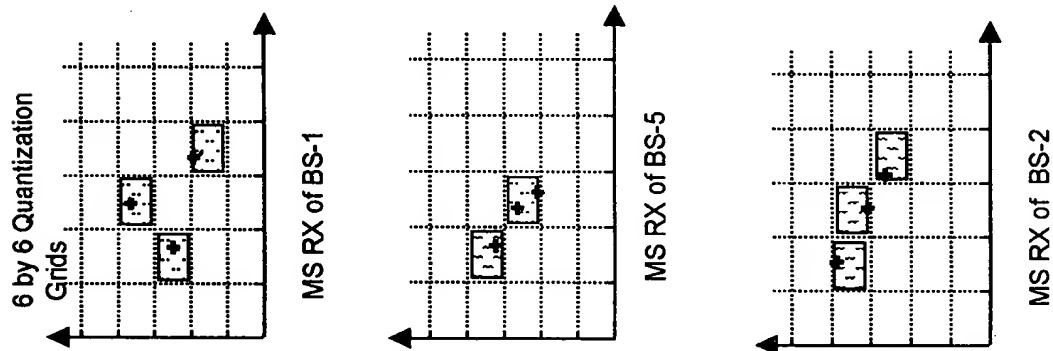


Fig. 14



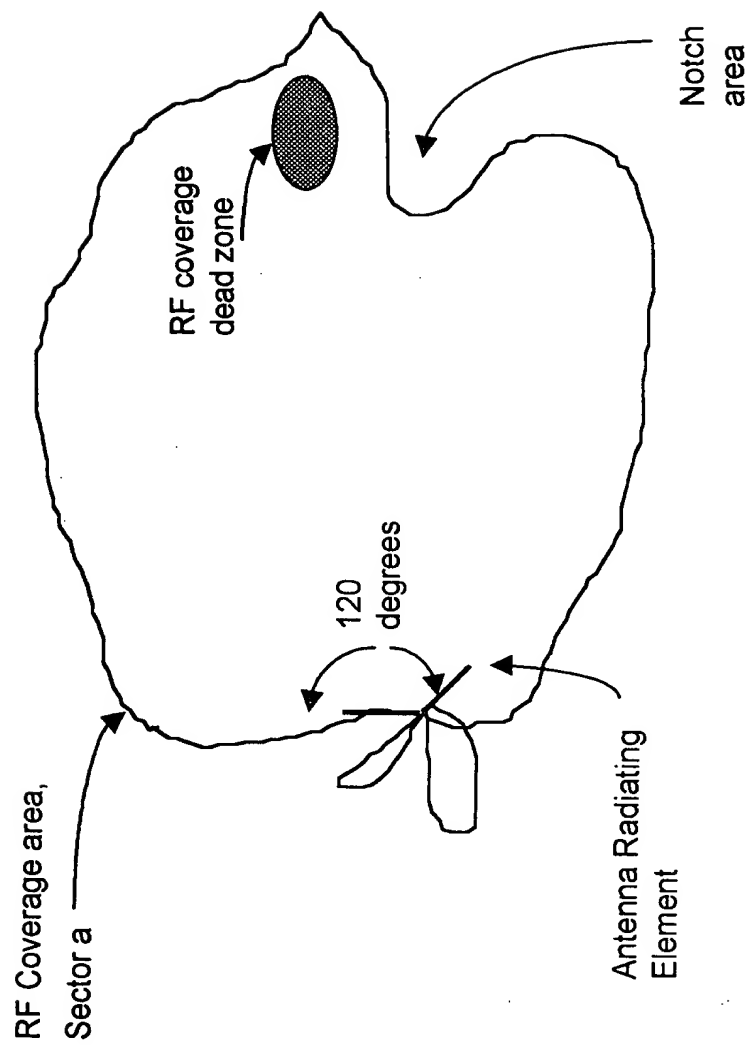


FIG. 15

Fig. 16a

Location Signature Data Type

MS_type: The make and model of the target MS 140 associated with a location signature instantiation;

BS_id: An identification of the base station 122 (location base station 152) communicating with the target MS;

verified_flag: TRUE iff a location of MS_loc has been verified, FALSE otherwise. Note, if this field is TRUE (i.e., the loc sig is verified), then the base station identified by BS_id is the current primary base station for the target MS;

MS_loc: If verified_flag is TRUE, then this attribute includes an estimated location of the target MS.

If verified_flag is FALSE, then this attribute has a value indicating "location unknown".

Note this attribute may include the following two subfields: an area within which the target MS is presumed to be, and a point location (e.g., a latitude and longitude pair) where the target MS is presumed to be (in one embodiment this is the centroid of the area);

confidence: a value indicating how consistent this loc sig is with other loc sigs in the location signature data base 1320; the value for this entry is in the range [0, 1] with 0 corresponding to the lowest (i.e., no) confidence and 1 corresponding to the highest confidence;

timestamp: The time and date when the location signature was received by the base station of BS_id;

Fig. 16c

- power_level:** The power levels of the associated BS 122 and MS 140 for the signal data used for this loc sig;
- timing_error:** An estimated (or maximum) timing error between the associated base station (e.g., an infrastructure base station 122 or a location base station 152) detecting the associated target MS 140 and the current primary BS 122 for this target MS. Note that if the BS 122 associated with the loc sig is the primary base station (e.g., when the loc sig is verified), then the value here will be zero;
- cluster_ptr:** A pointer to the location signature cluster to which this loc sig belongs.

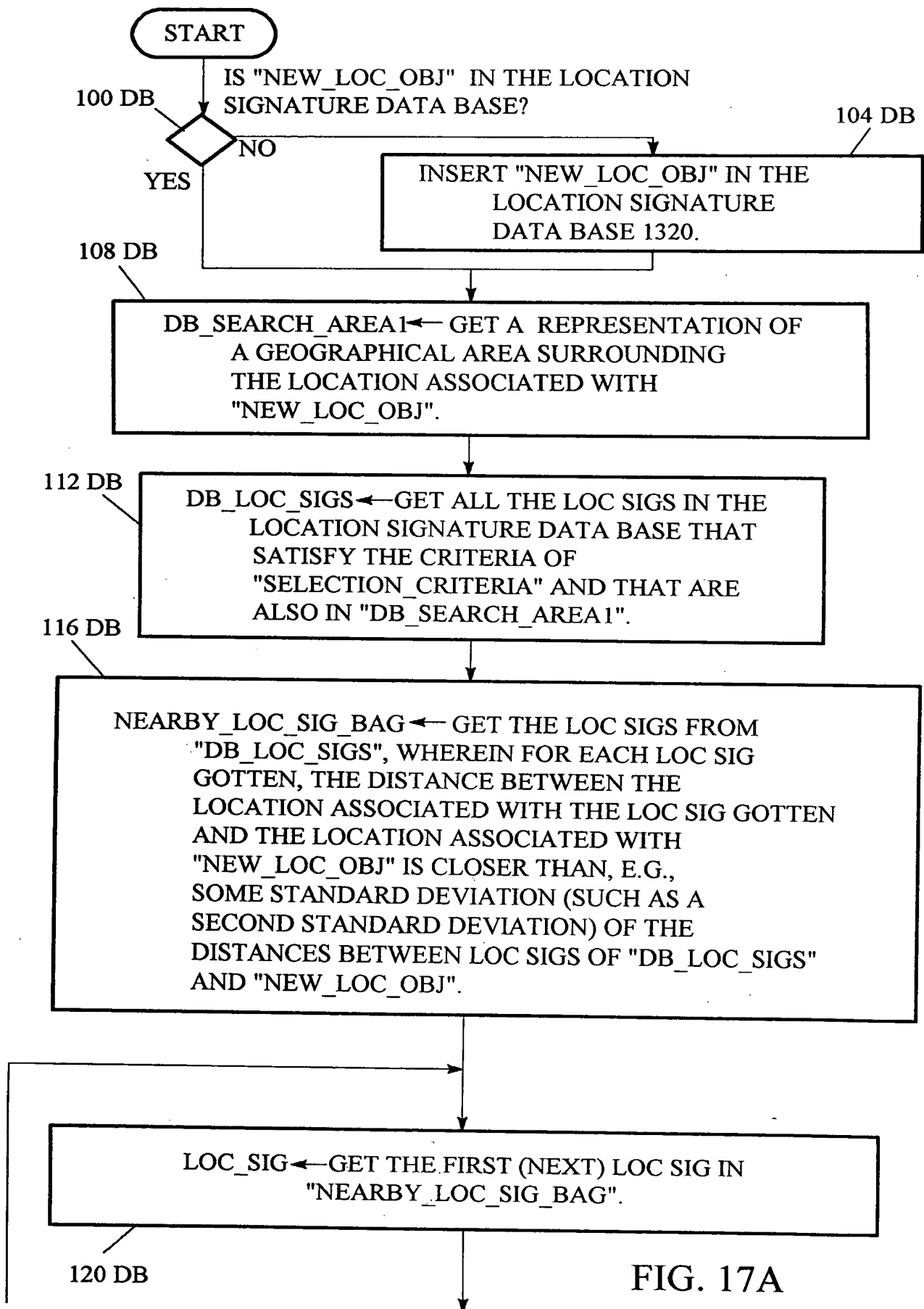
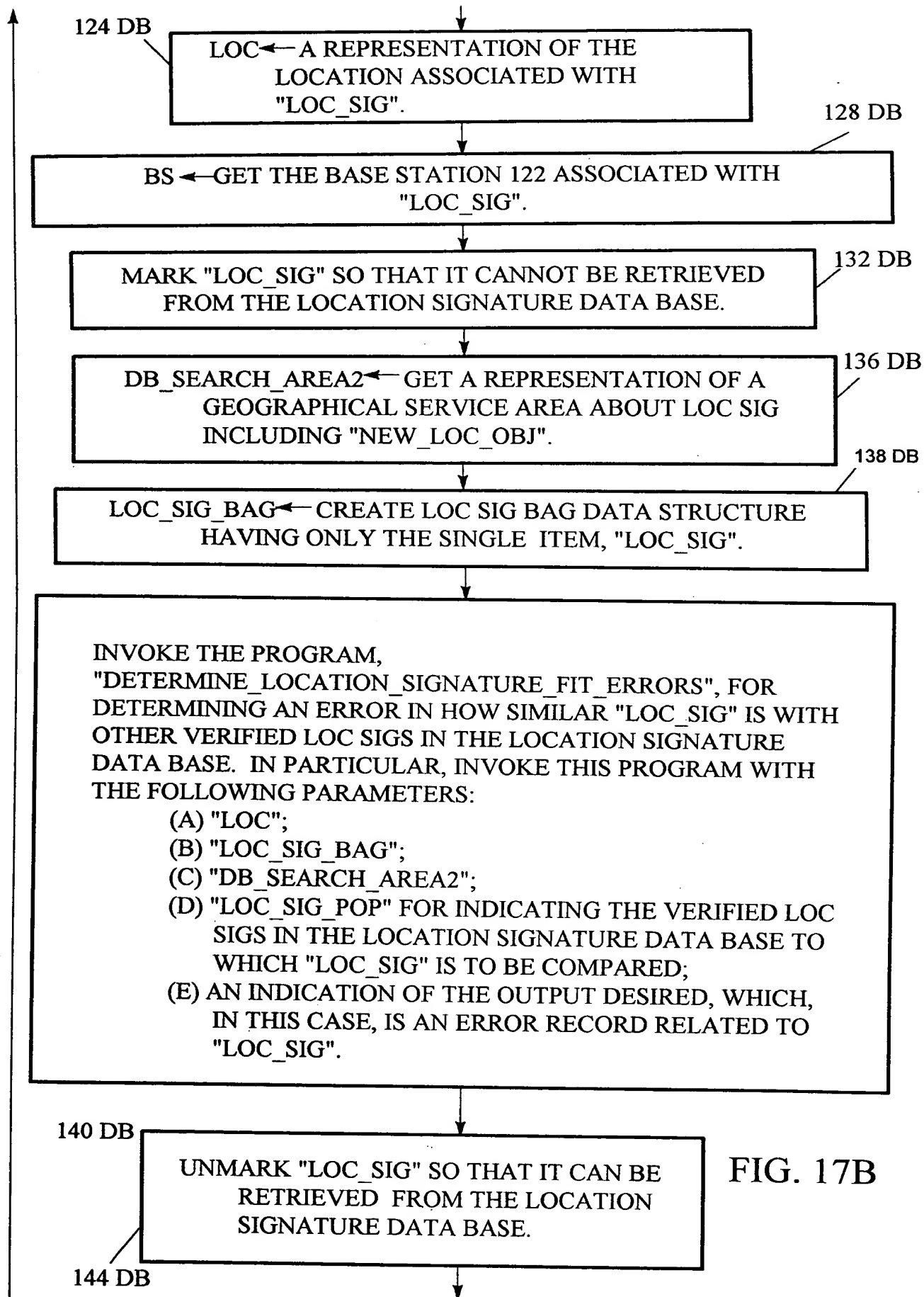


FIG. 17A



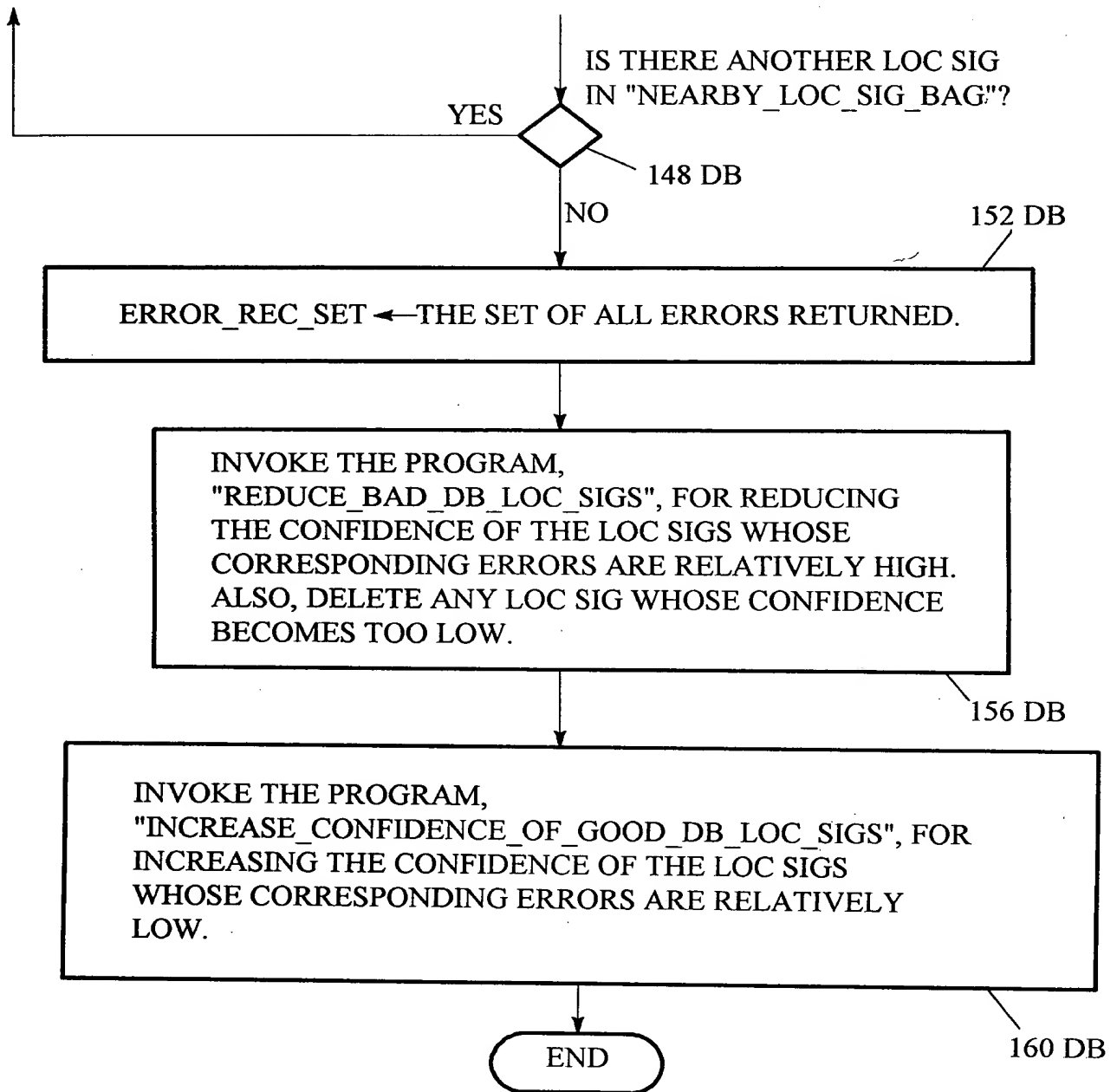


FIG. 17C

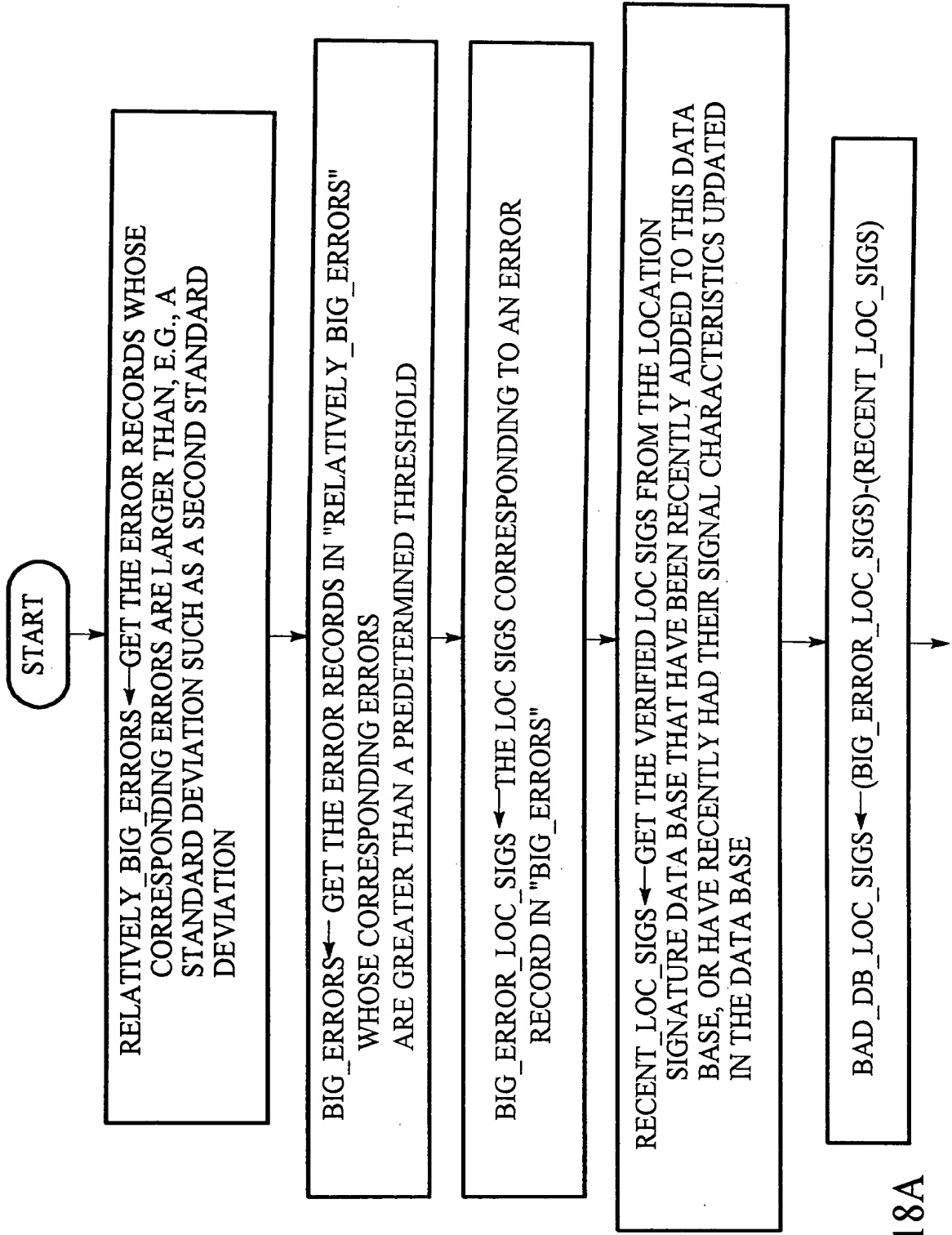


FIG. 18A

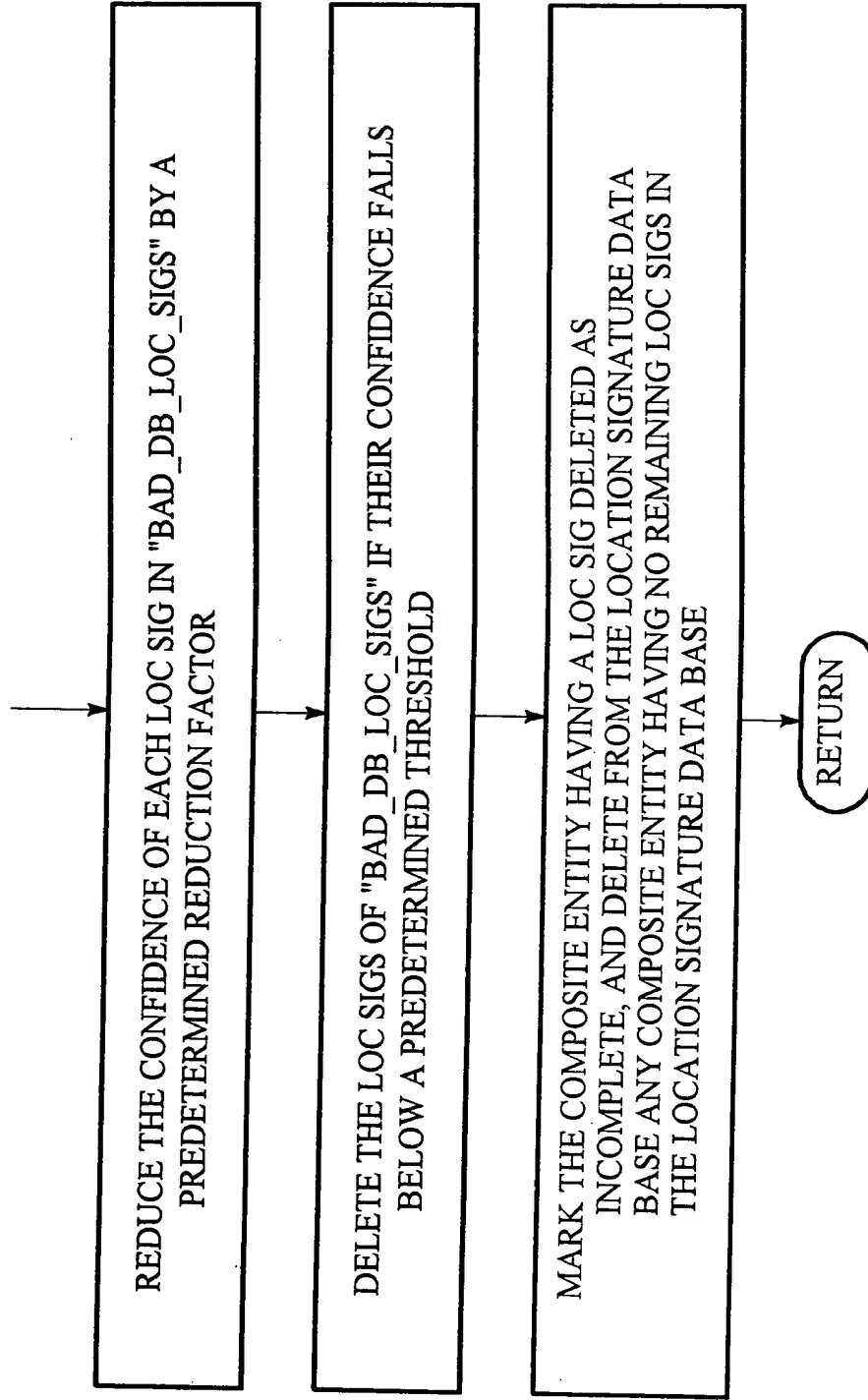


FIG. 18B

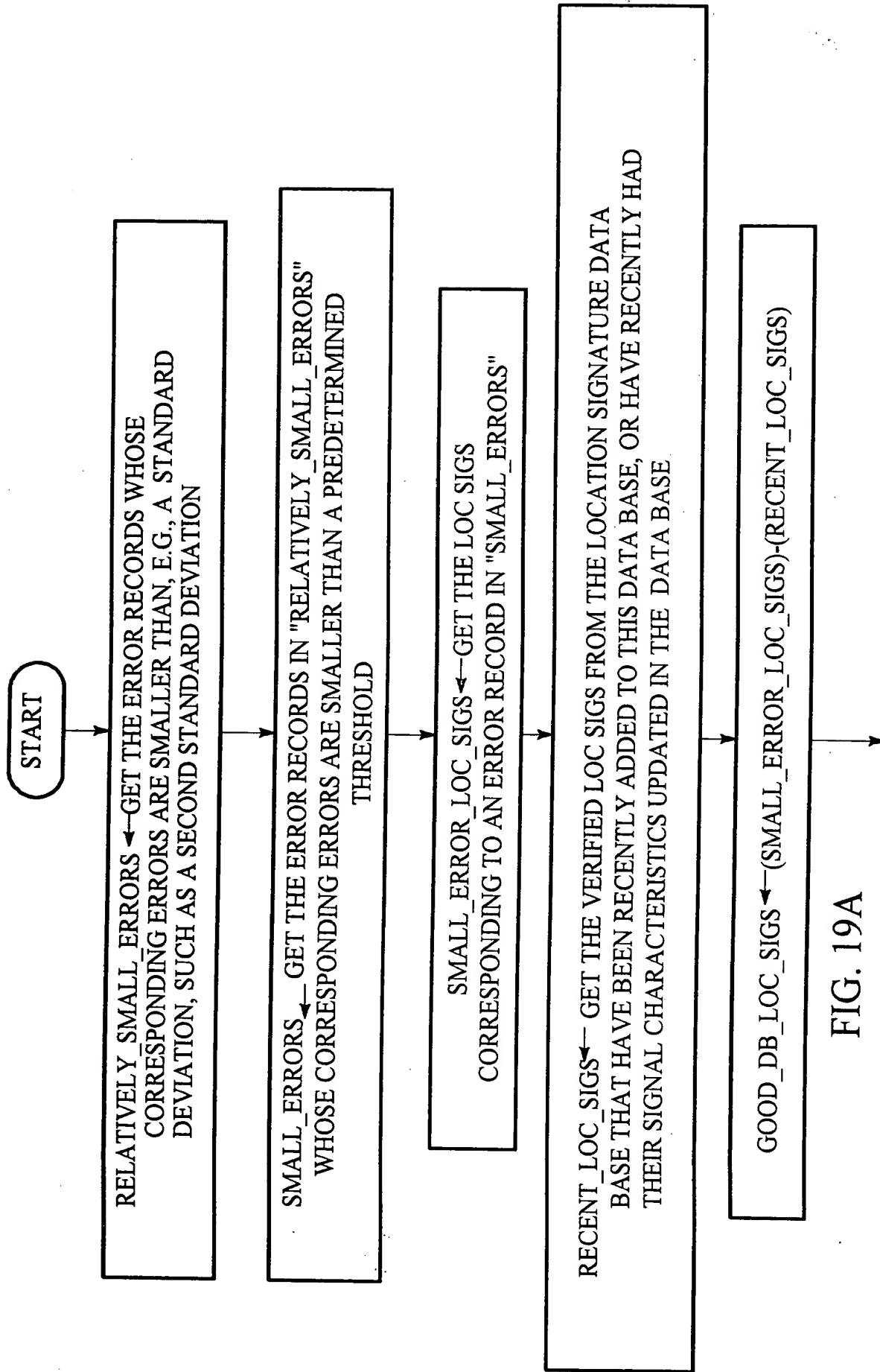


FIG. 19A

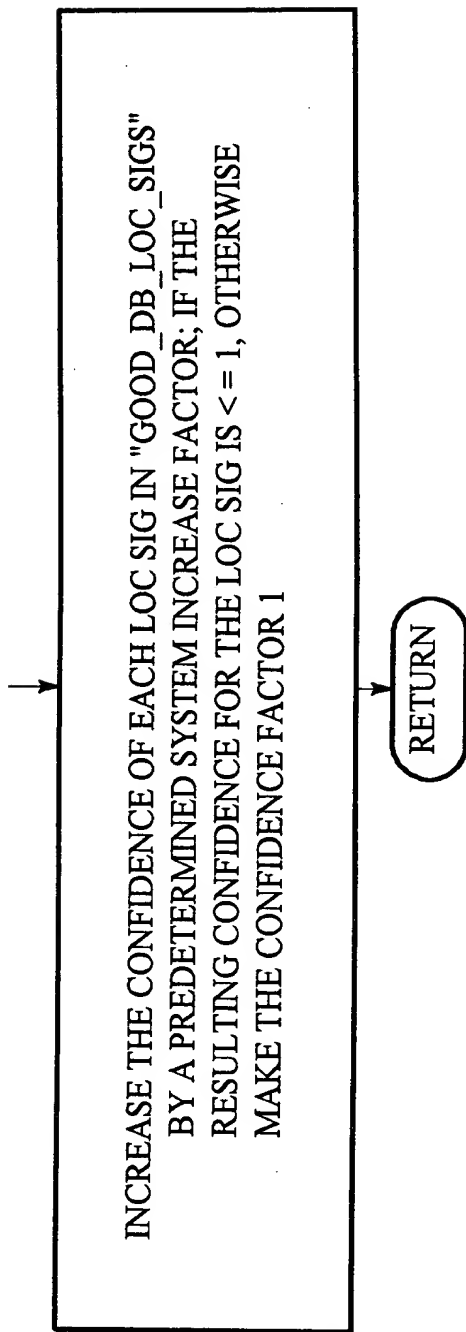
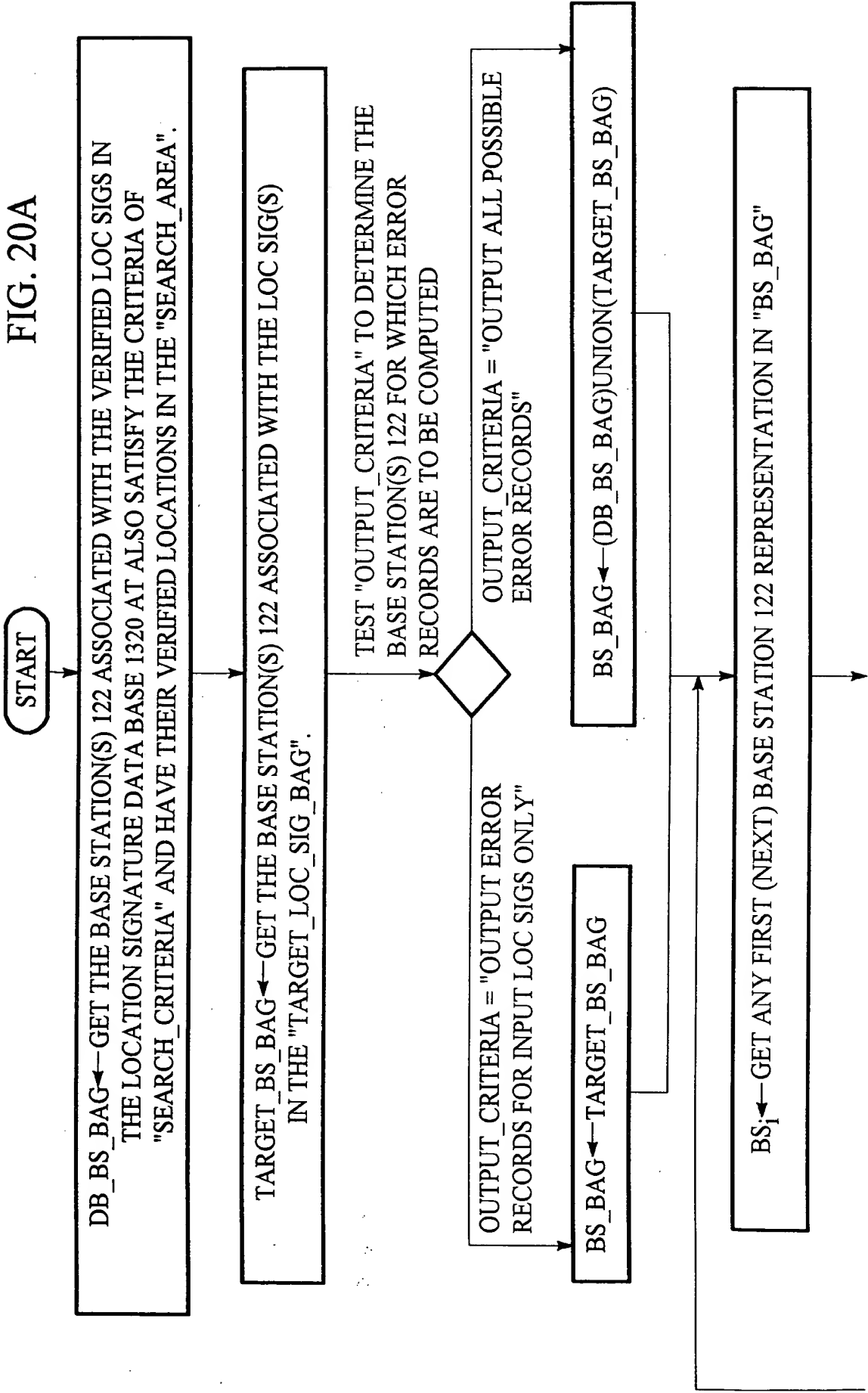
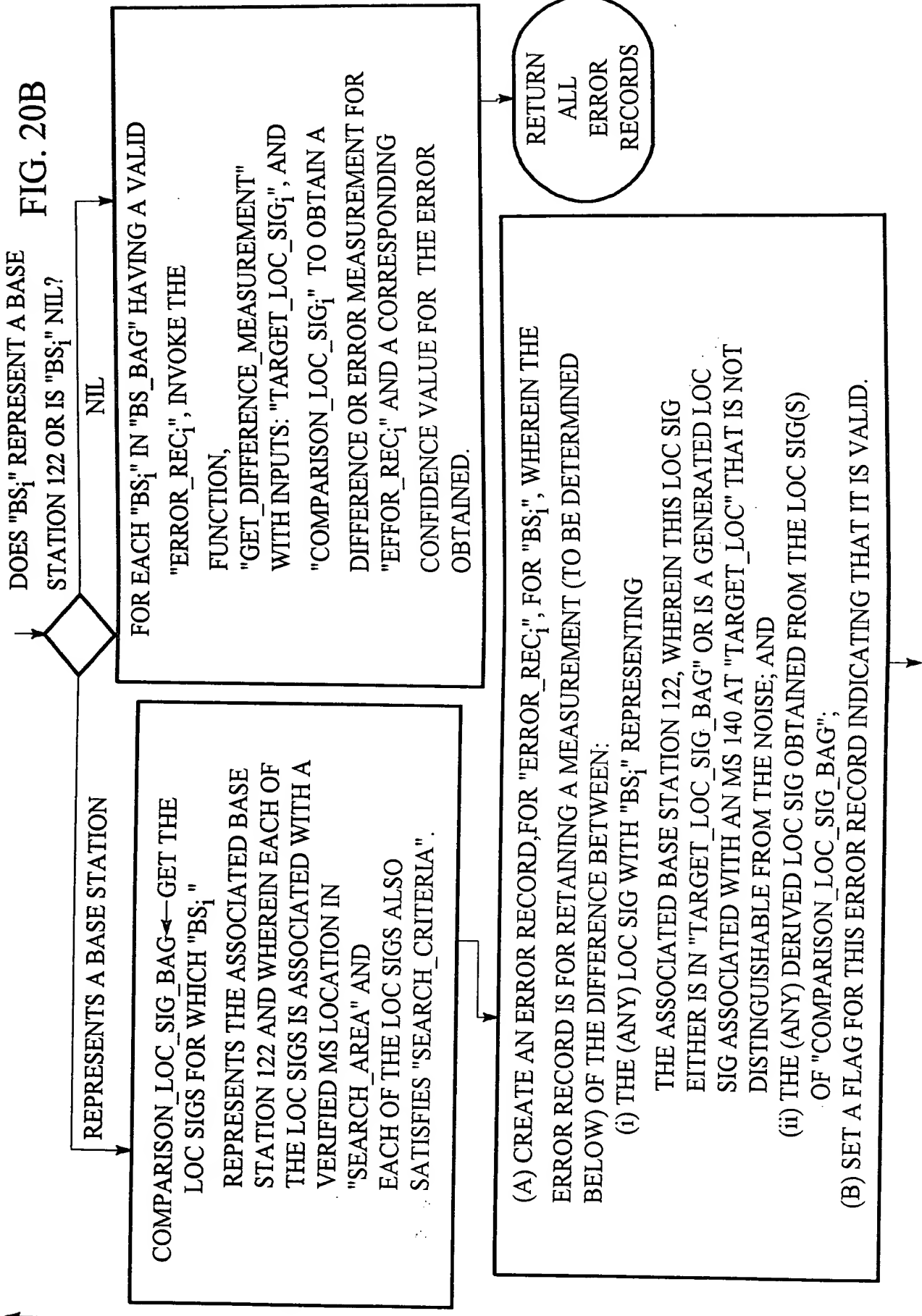
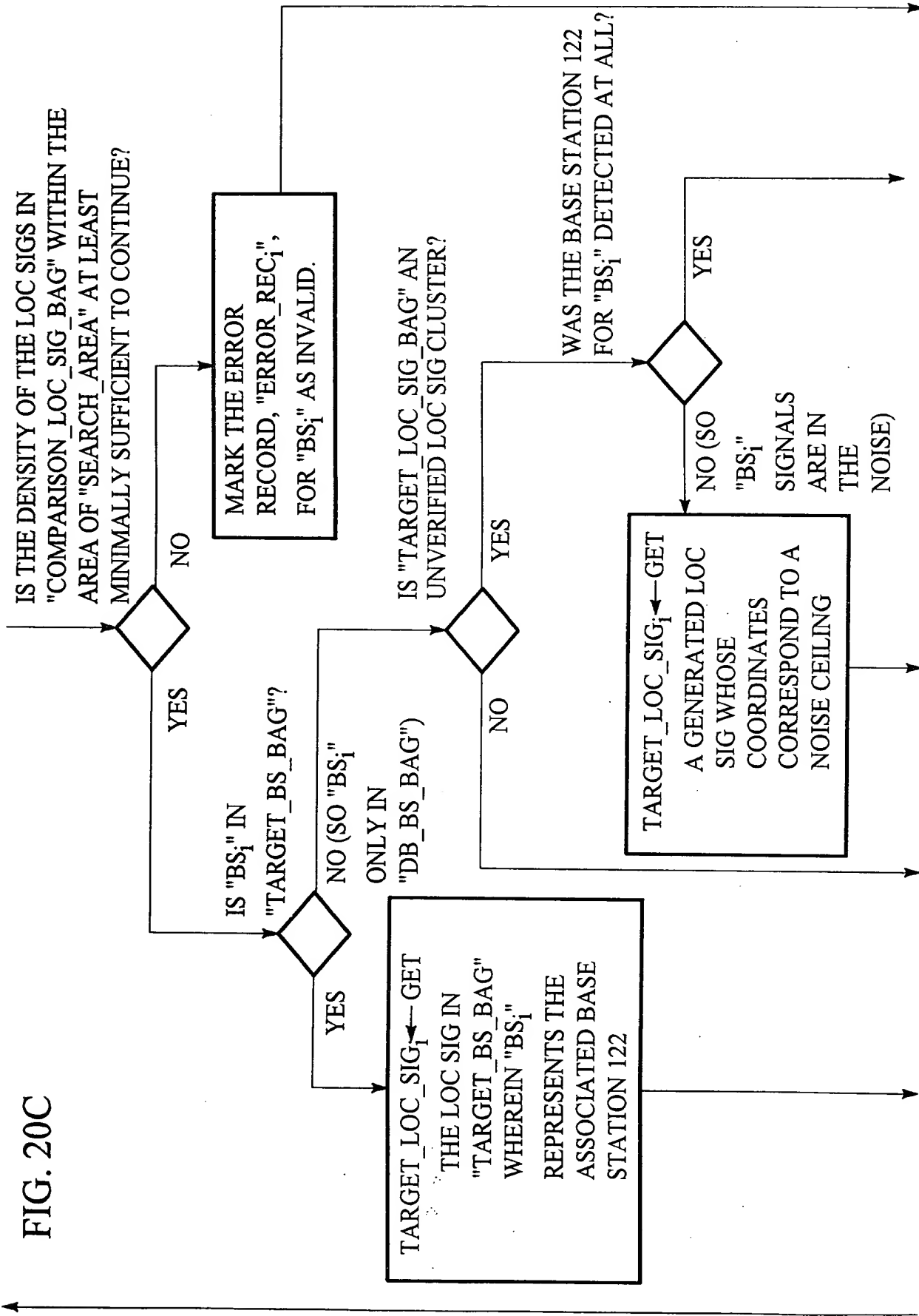


FIG. 19B

FIG. 20A







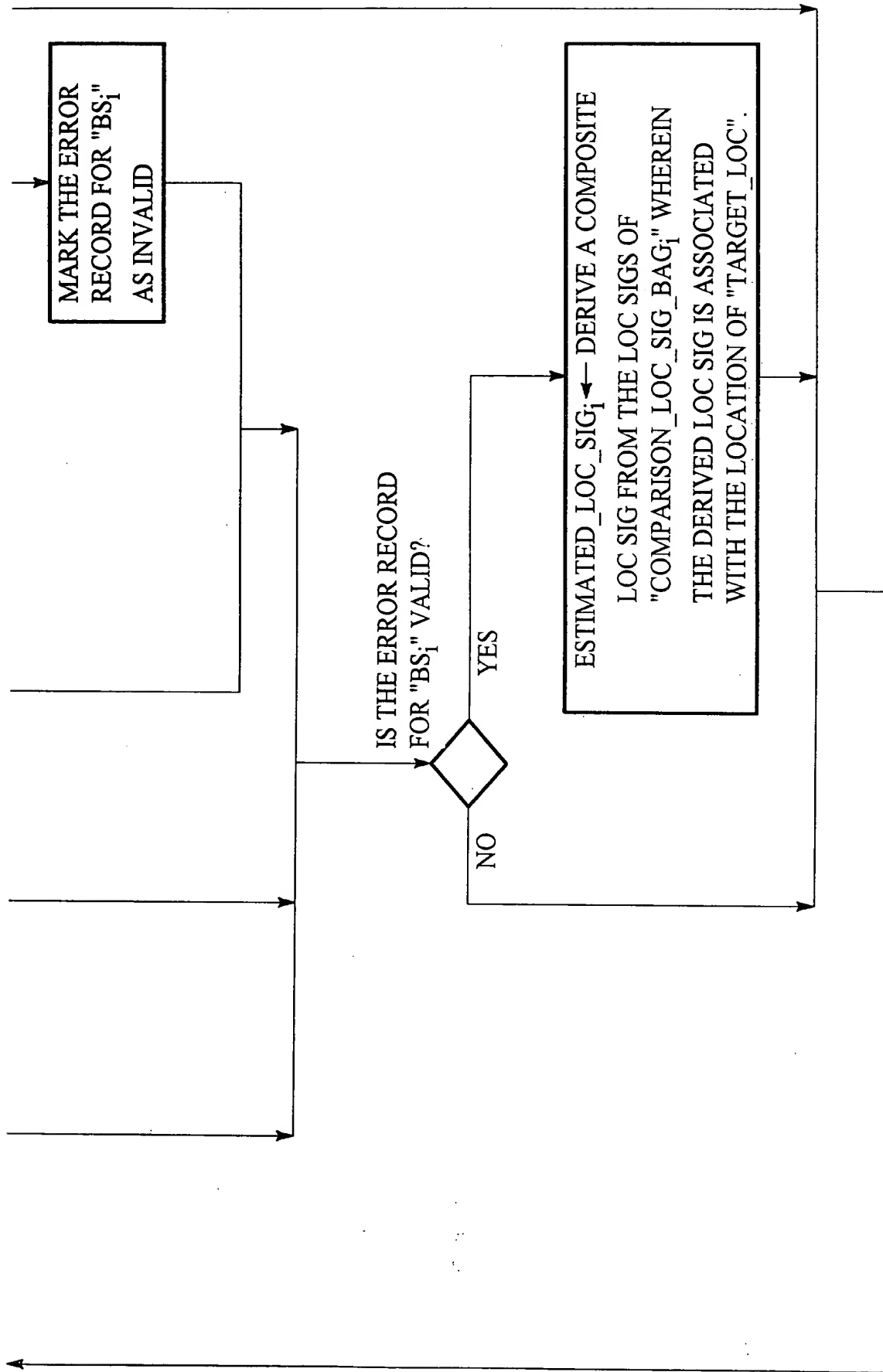


FIG. 20D

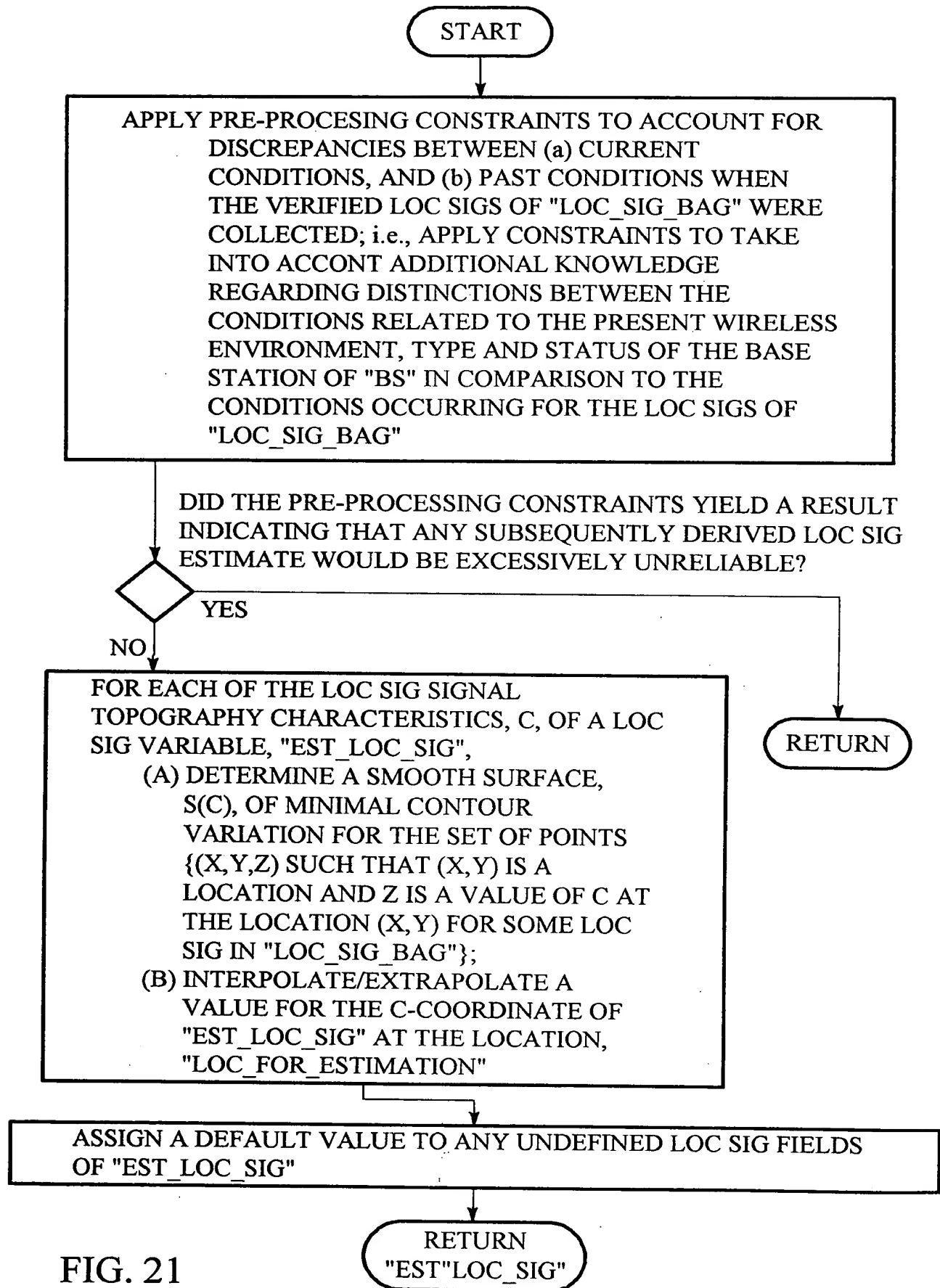


FIG. 21

FIG. 22A

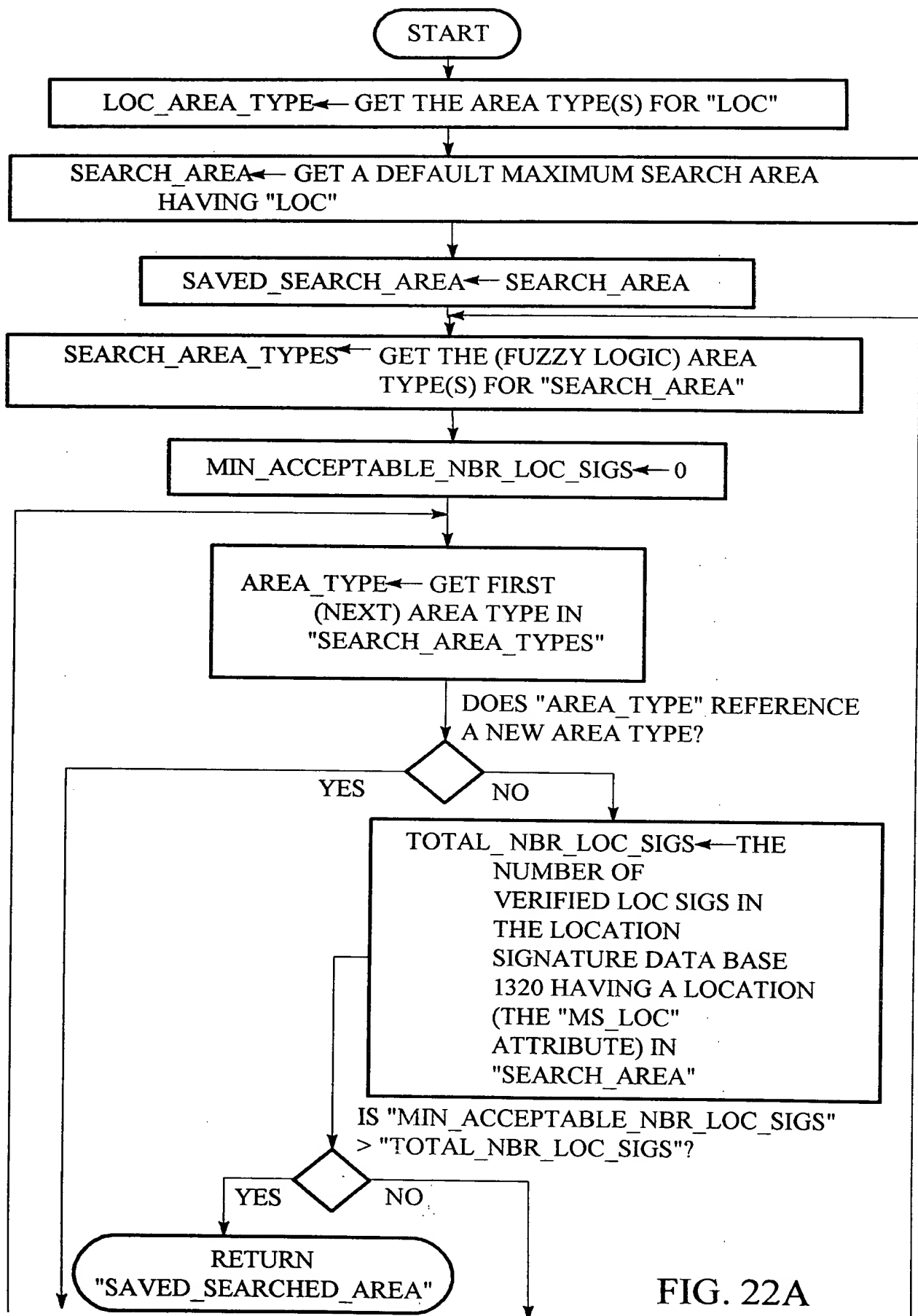


FIG. 22A

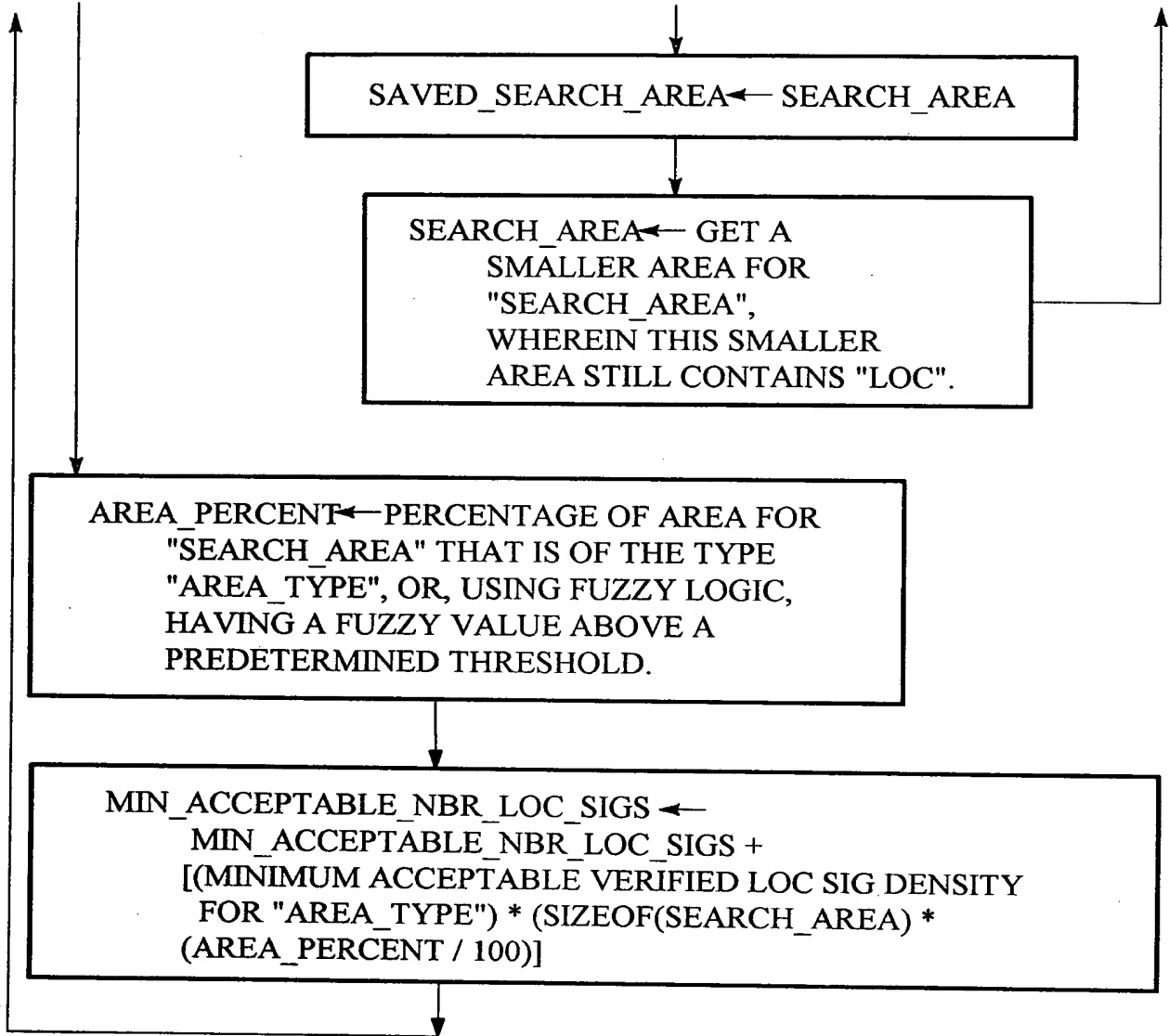
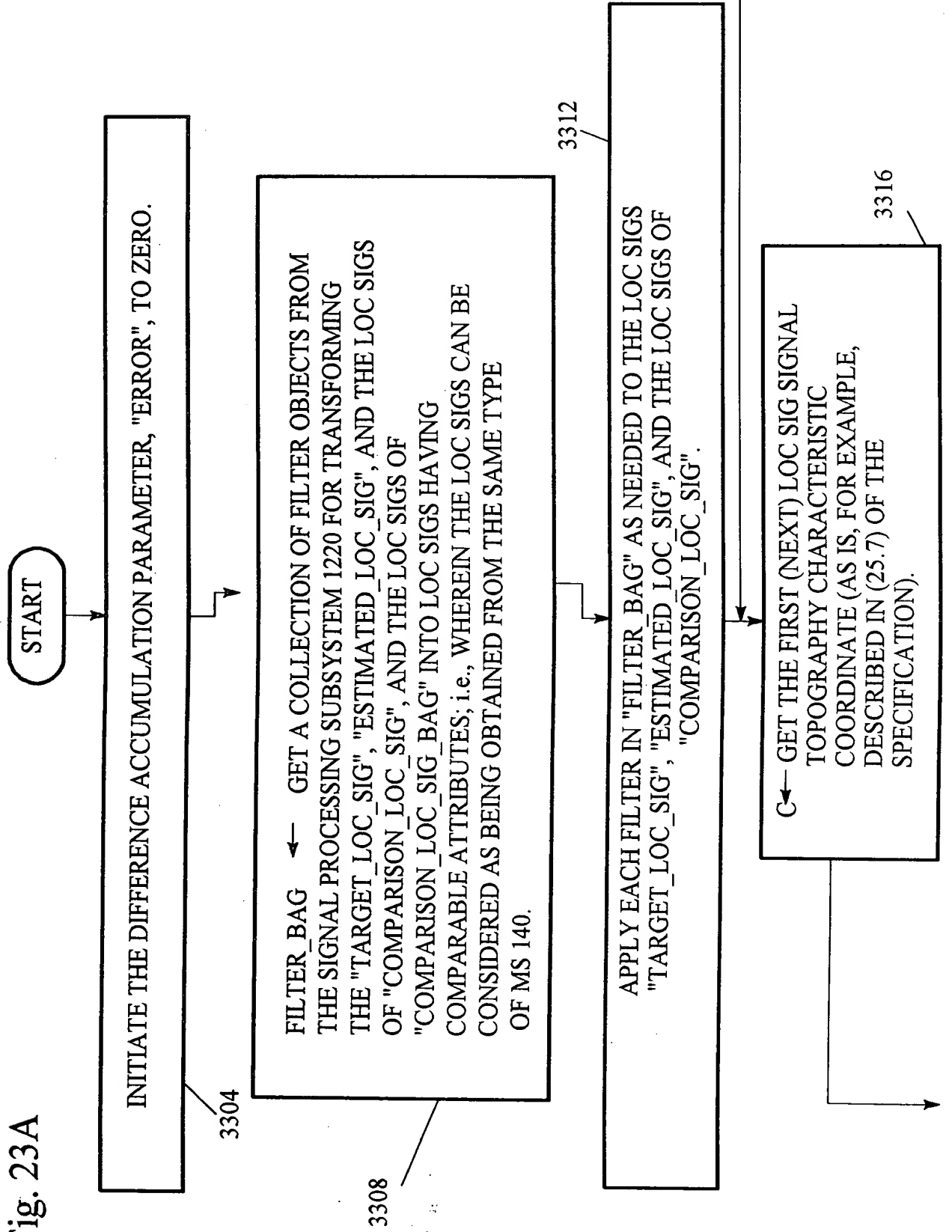


FIG. 22B

Fig. 23A



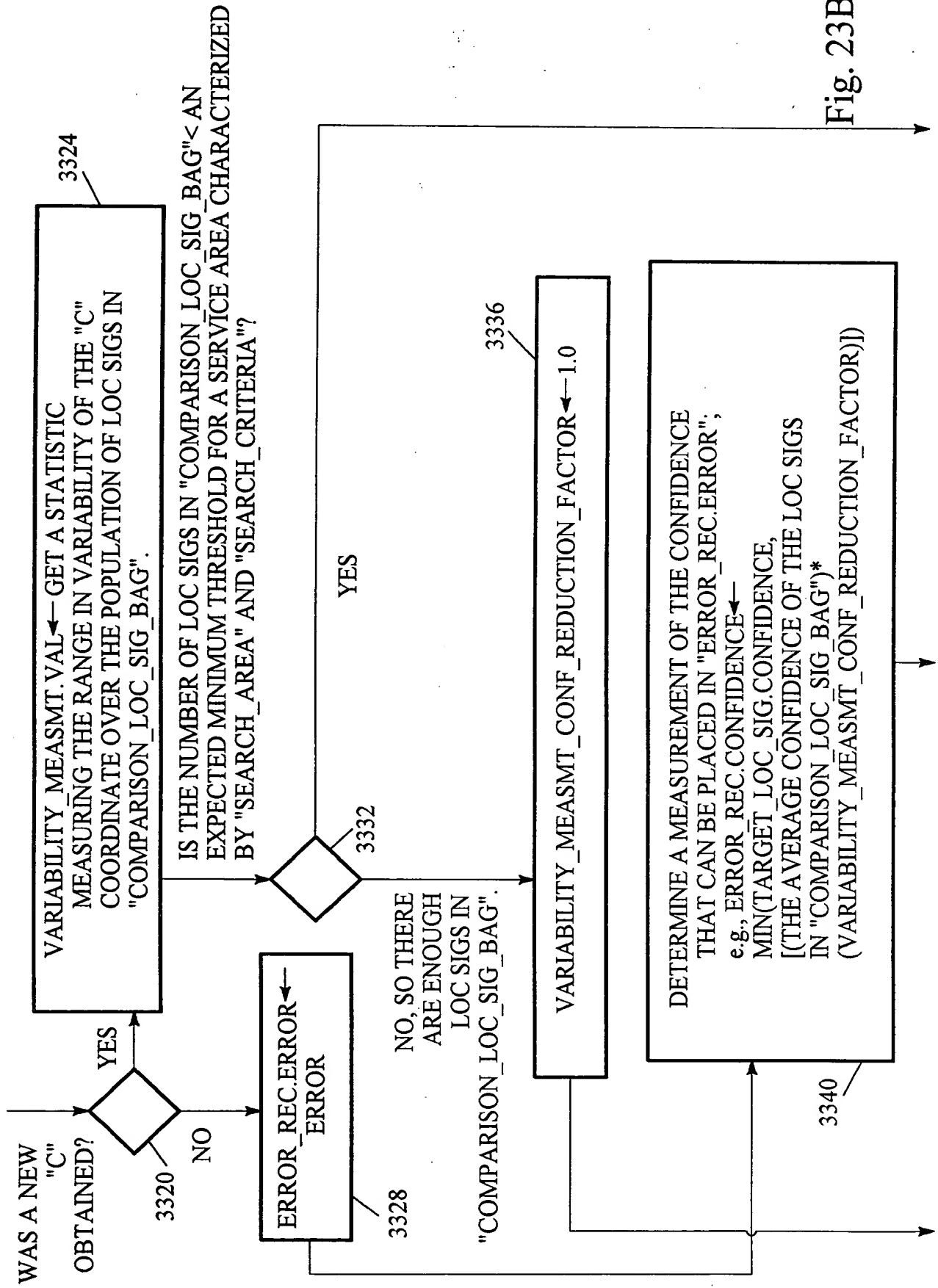


Fig. 23B

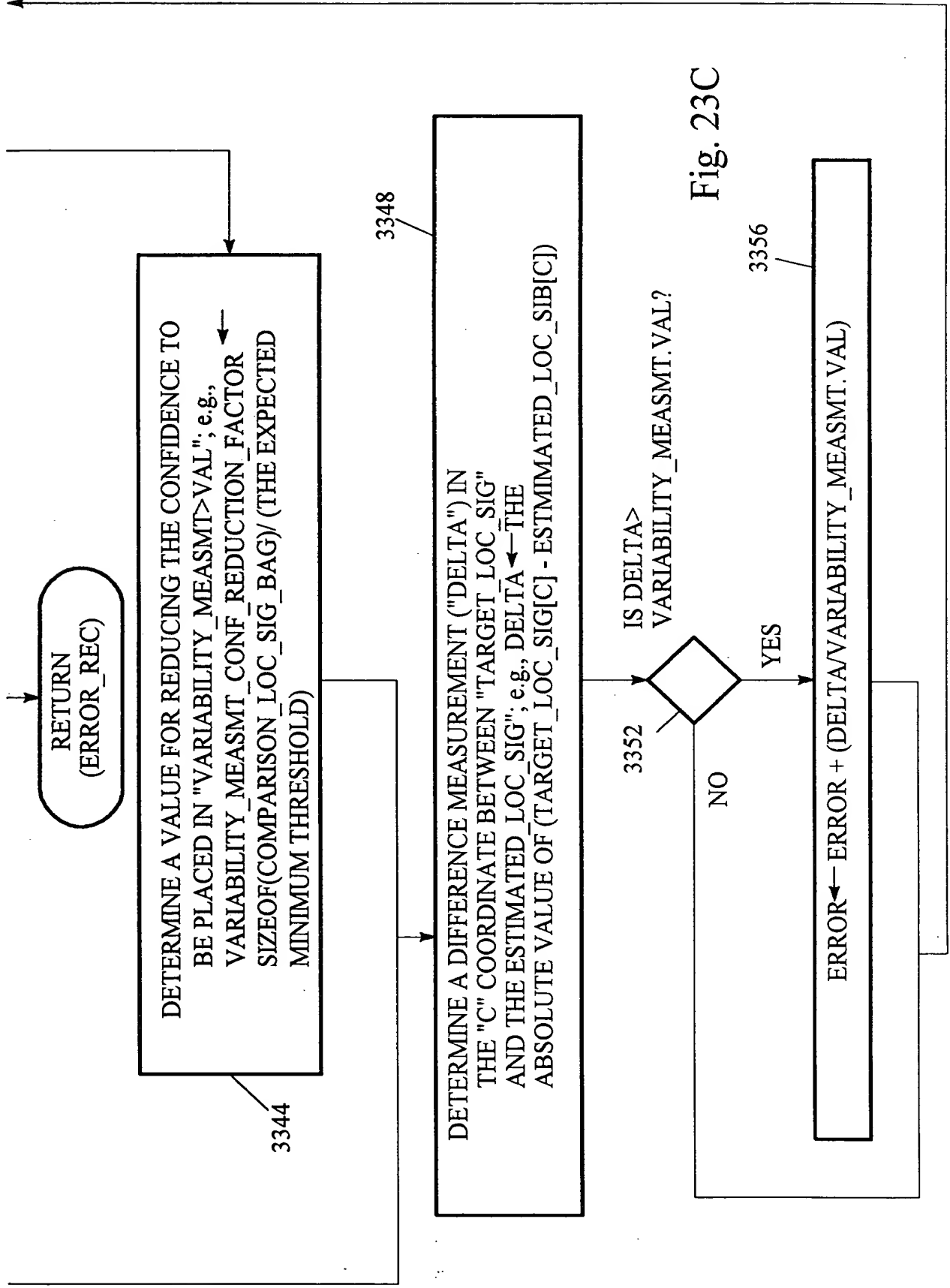


Fig. 23C

FIG. 24

■ = Previous MS location estimates by the present FOM;

"The cluster set" = The set of these FOM MS estimates that are:
(a) within "loc_hyp_pt_covering", and (b) have corresponding verified MS location in the Location Signature Data Base.

▲ = verified MS locations, in the Location Signature Data Base, having corresponding MS estimates (from the FOM identified by "loc_hyp_FOM_ID"), wherein the MS estimates are in "loc_hyp_pt_covering"

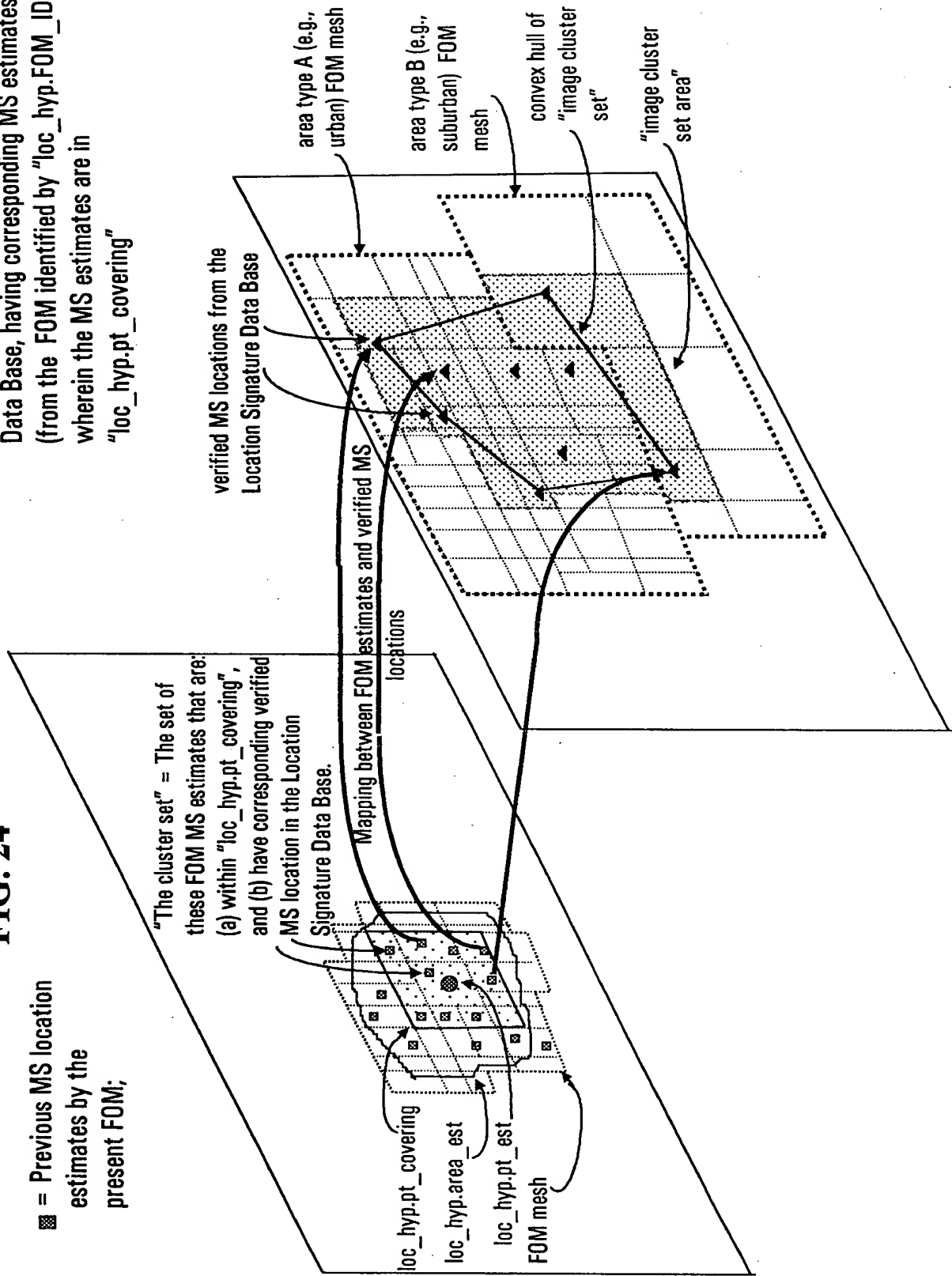
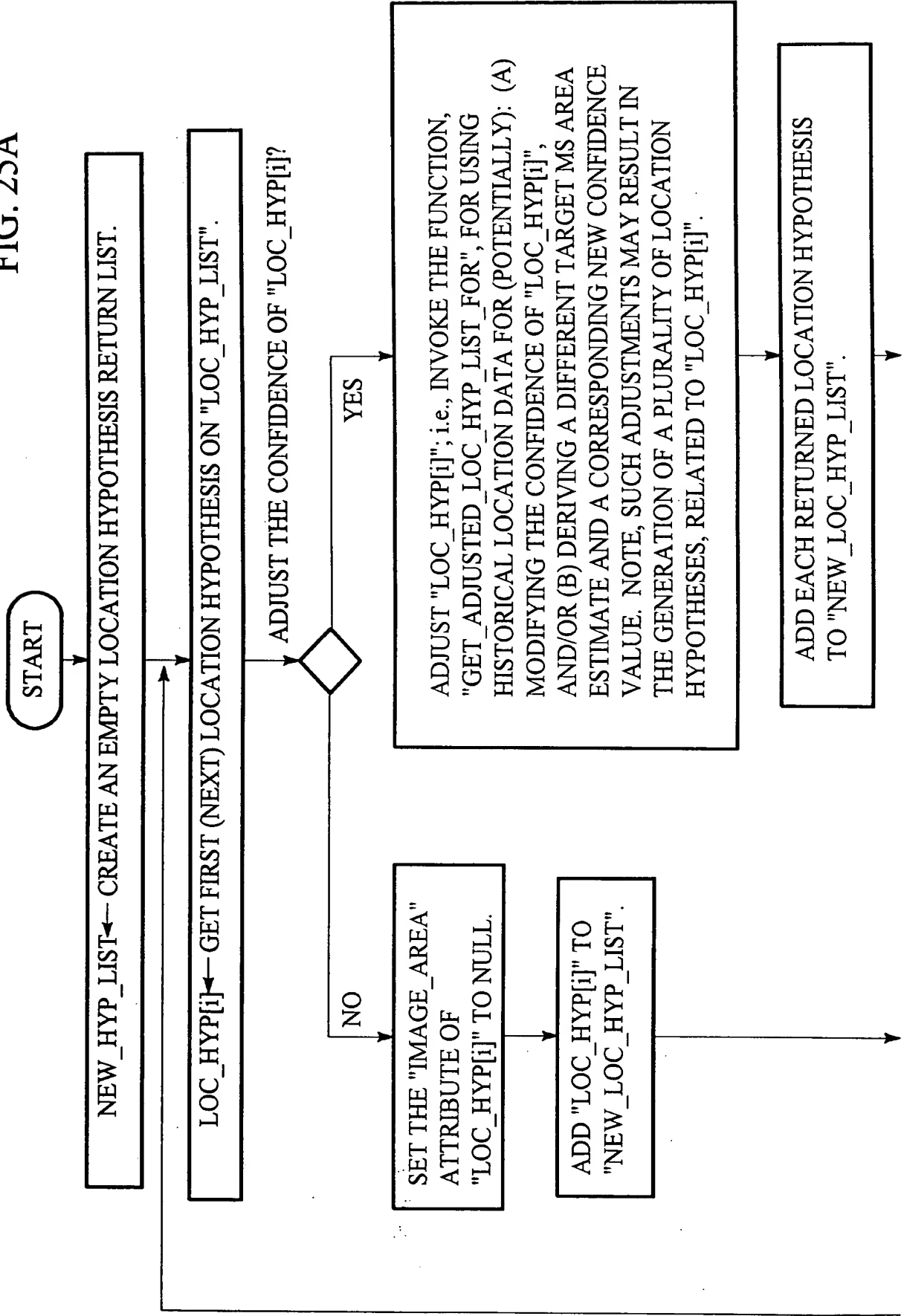


FIG. 25A



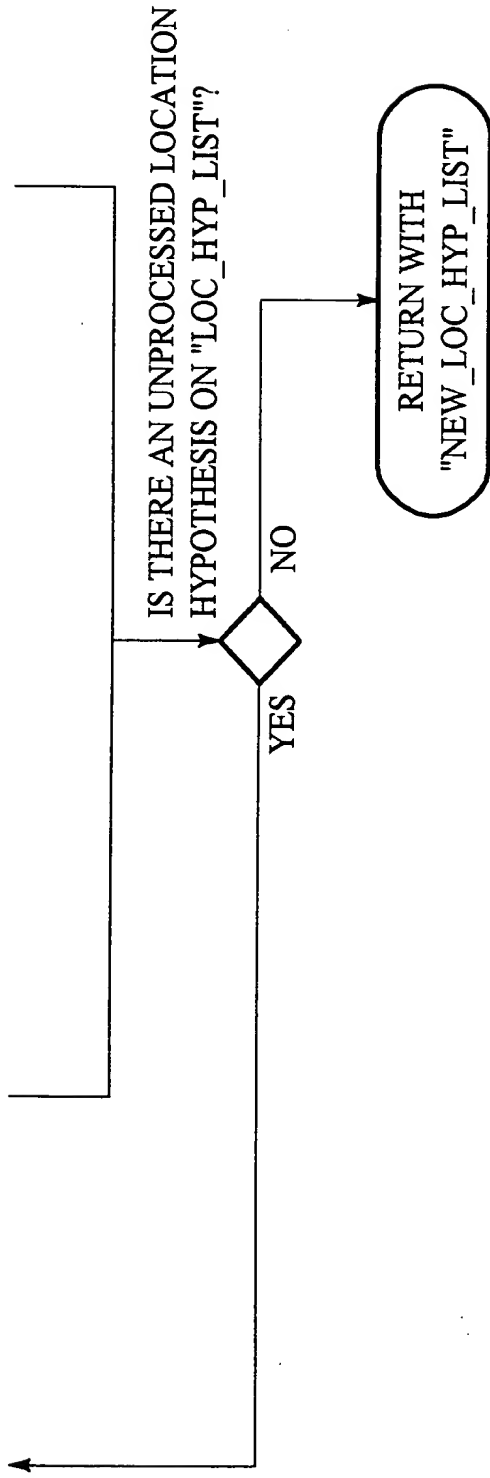
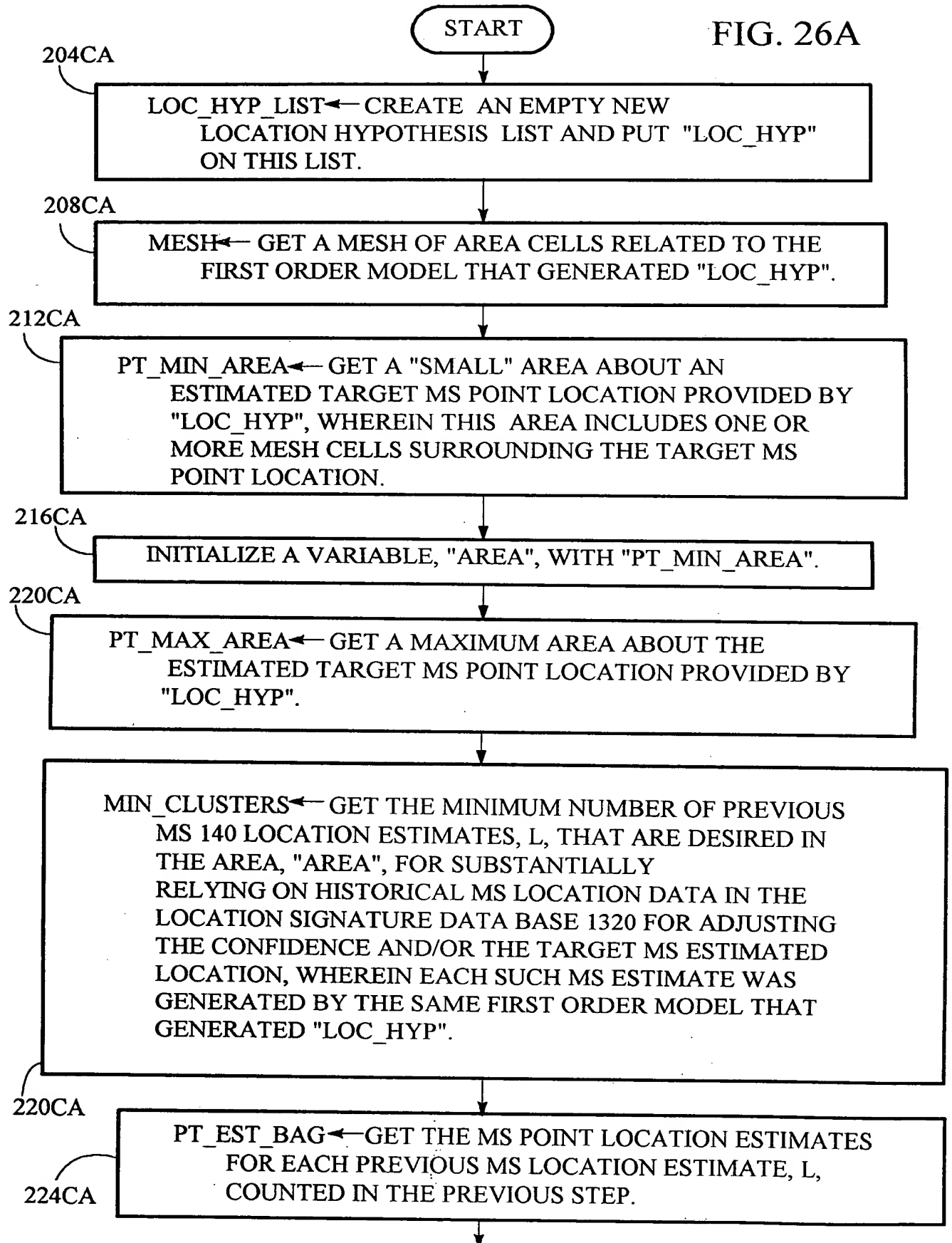
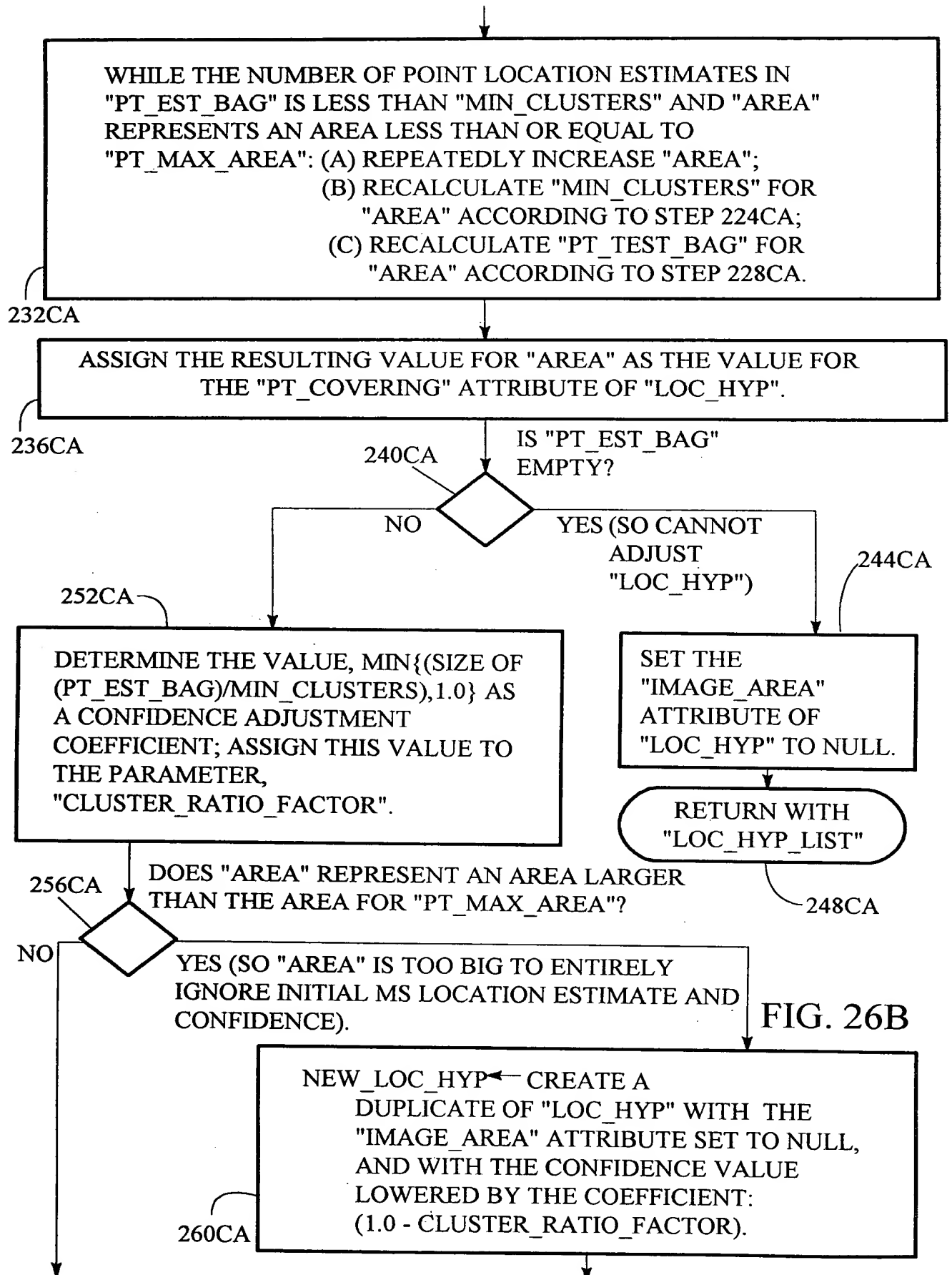


FIG. 25B

FIG. 26A





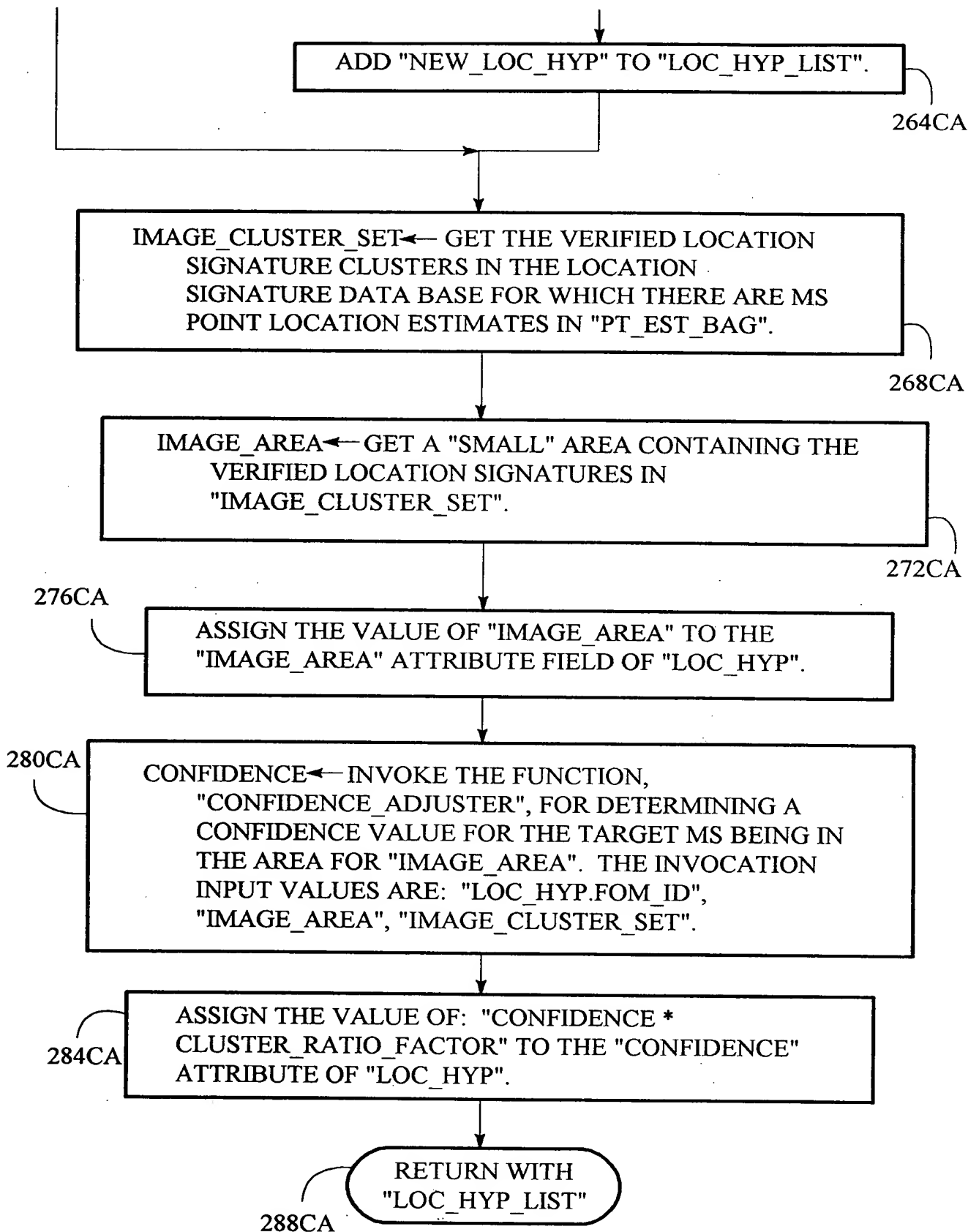


FIG. 26C

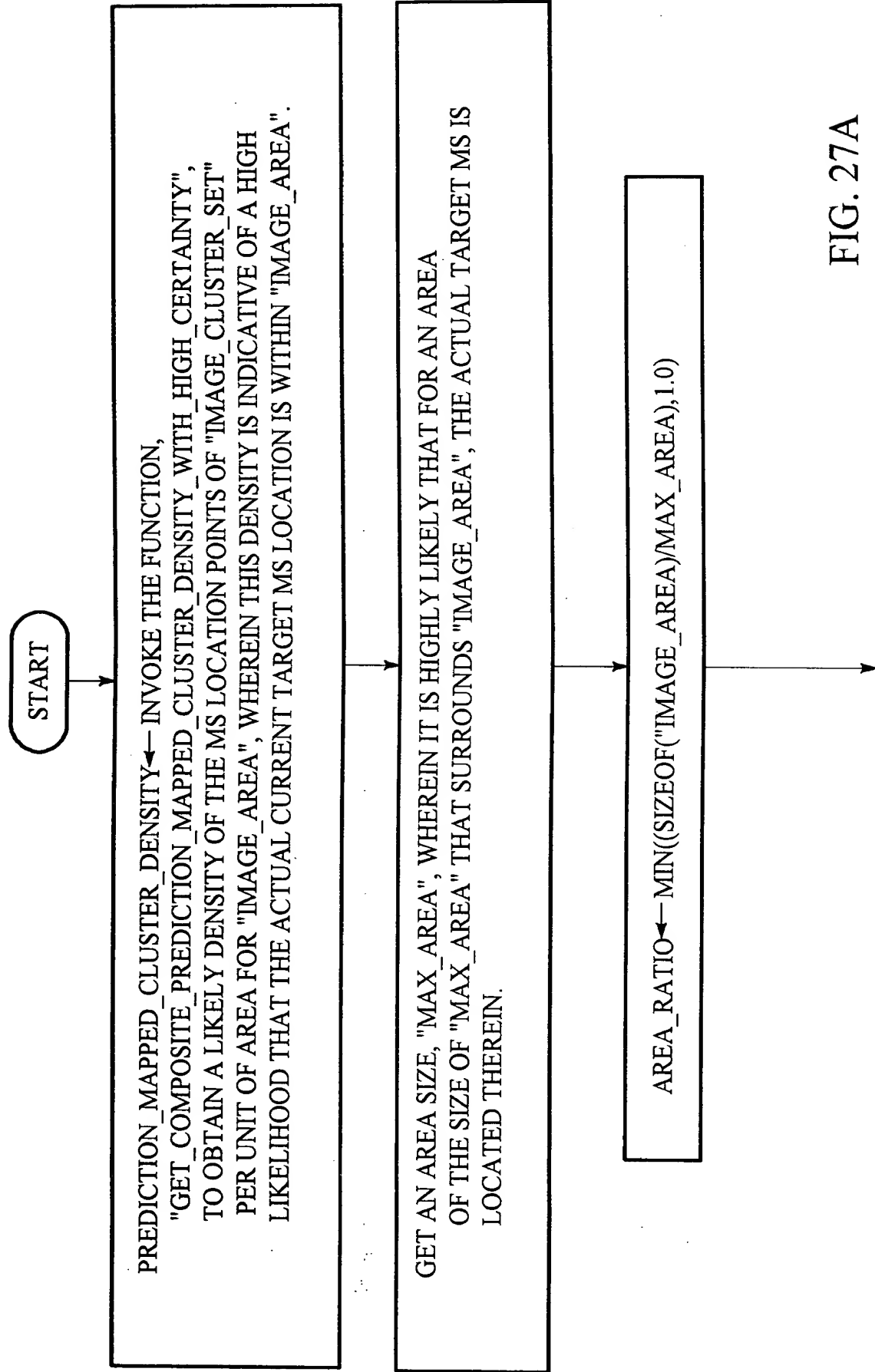


FIG. 27A

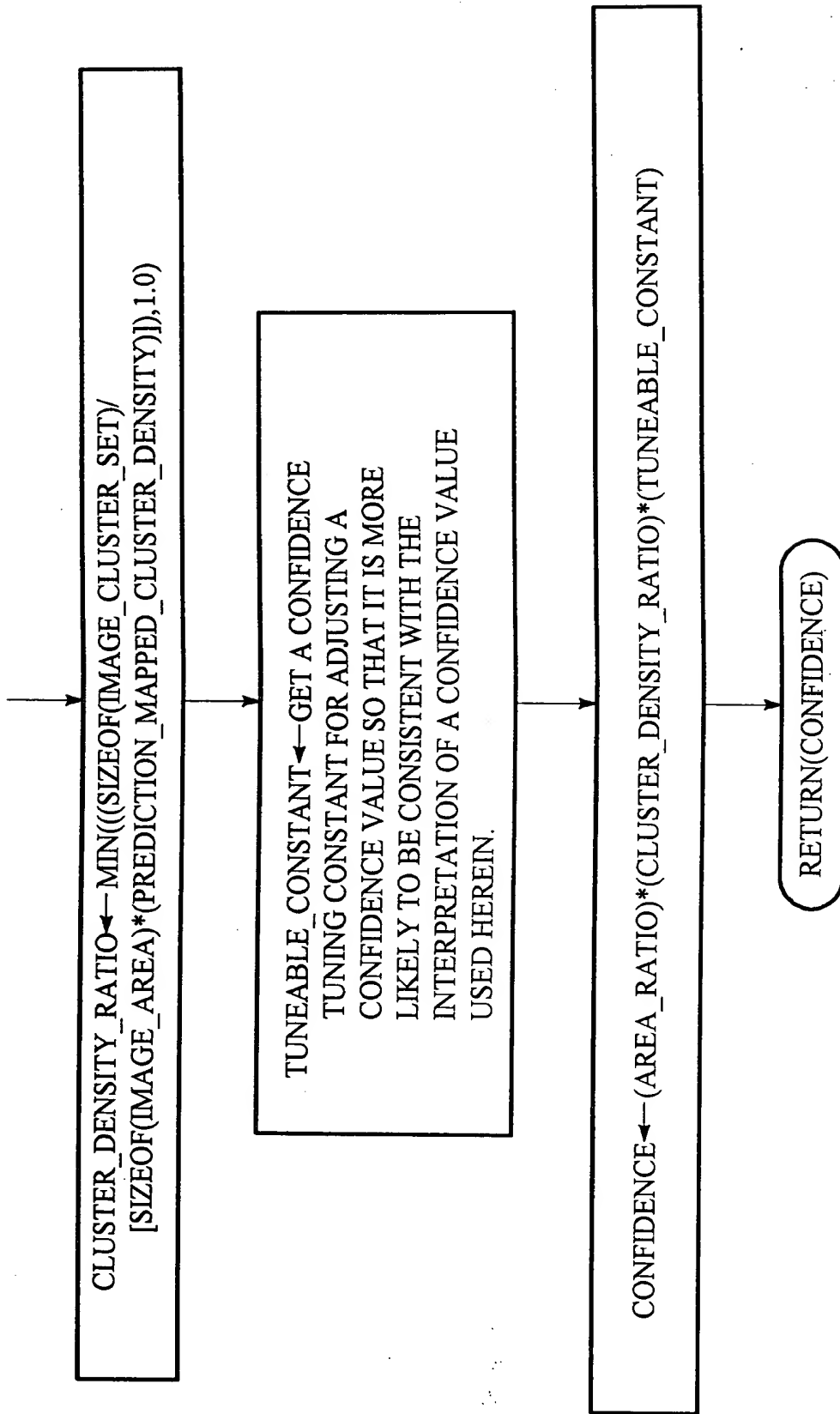


FIG. 27B

GET_COMPOSITE_PREDICTION_MAPPED_CLUSTER_DENSITY_WITH_HIGH_CERTAINTY
(FOM_ID, IMAGE_AREA)

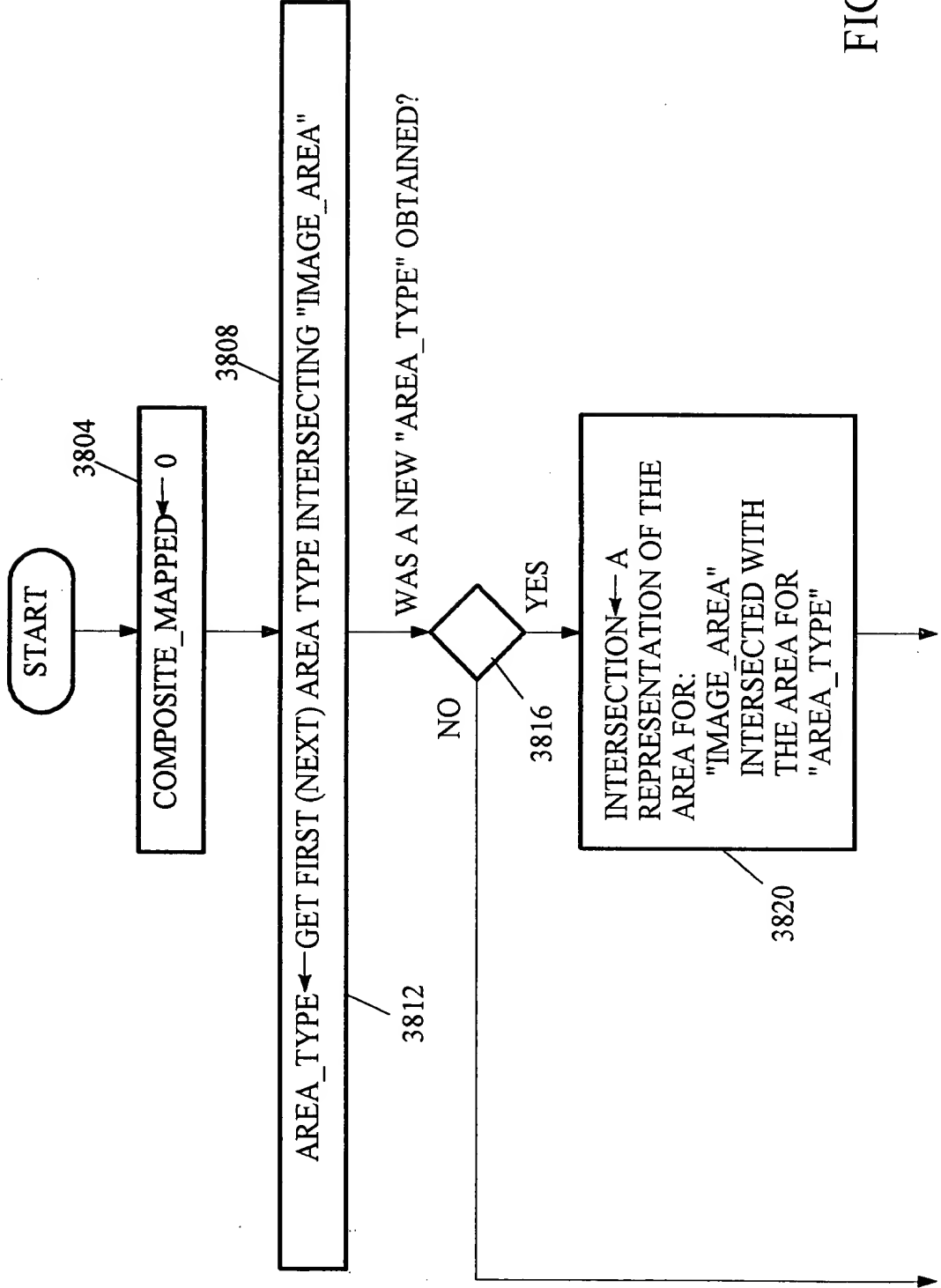


FIG. 28A

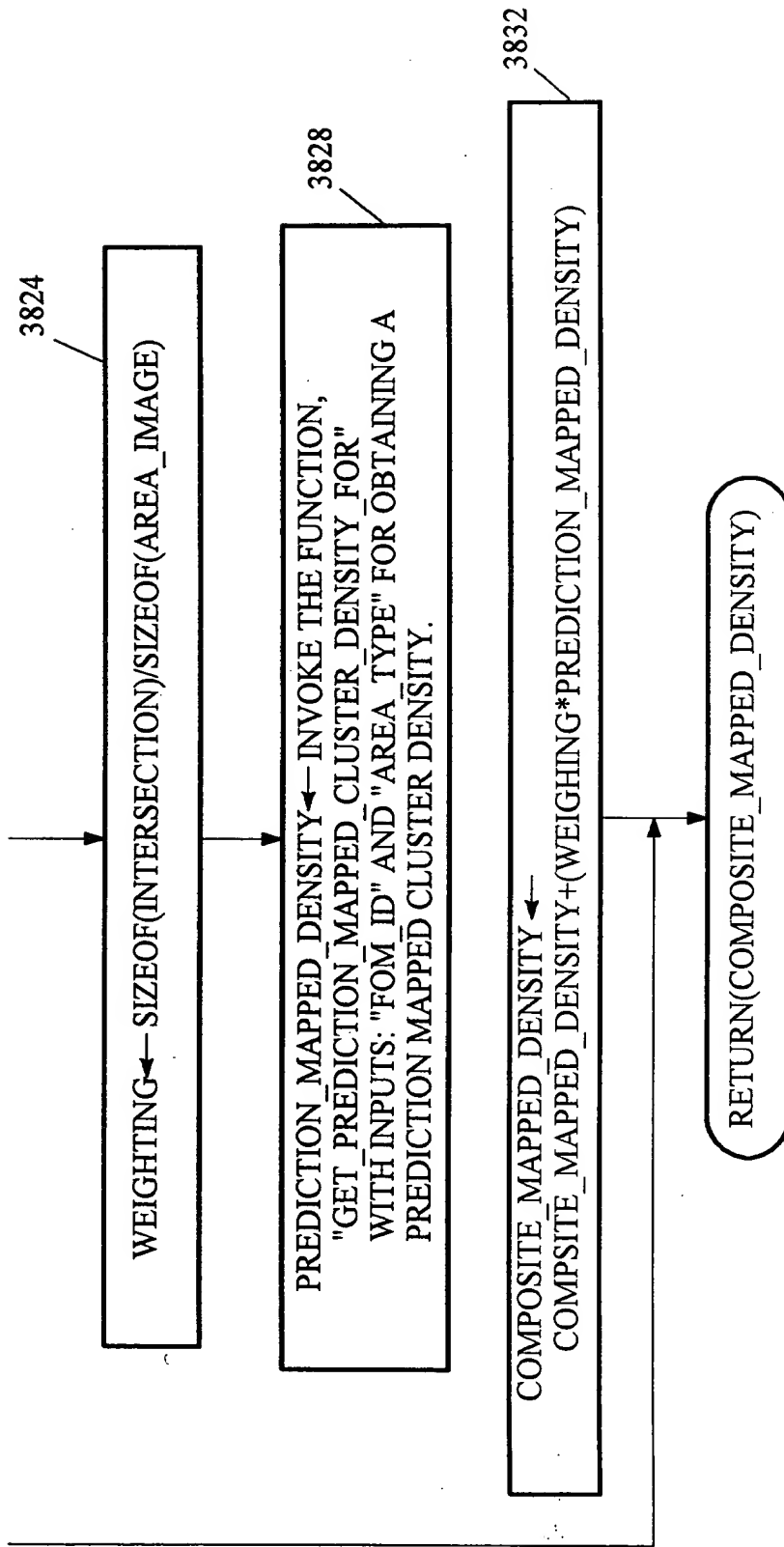


FIG. 28B

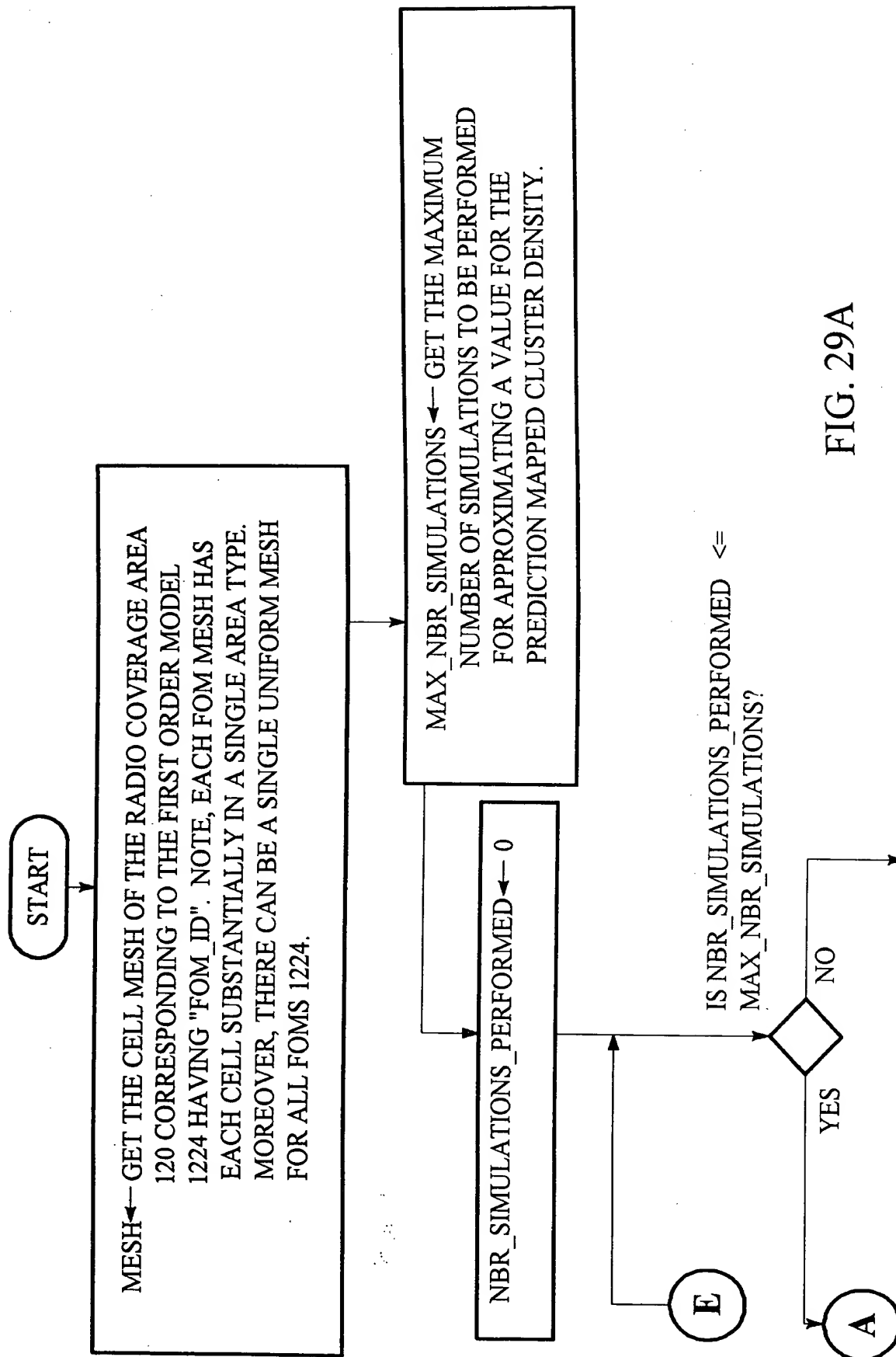
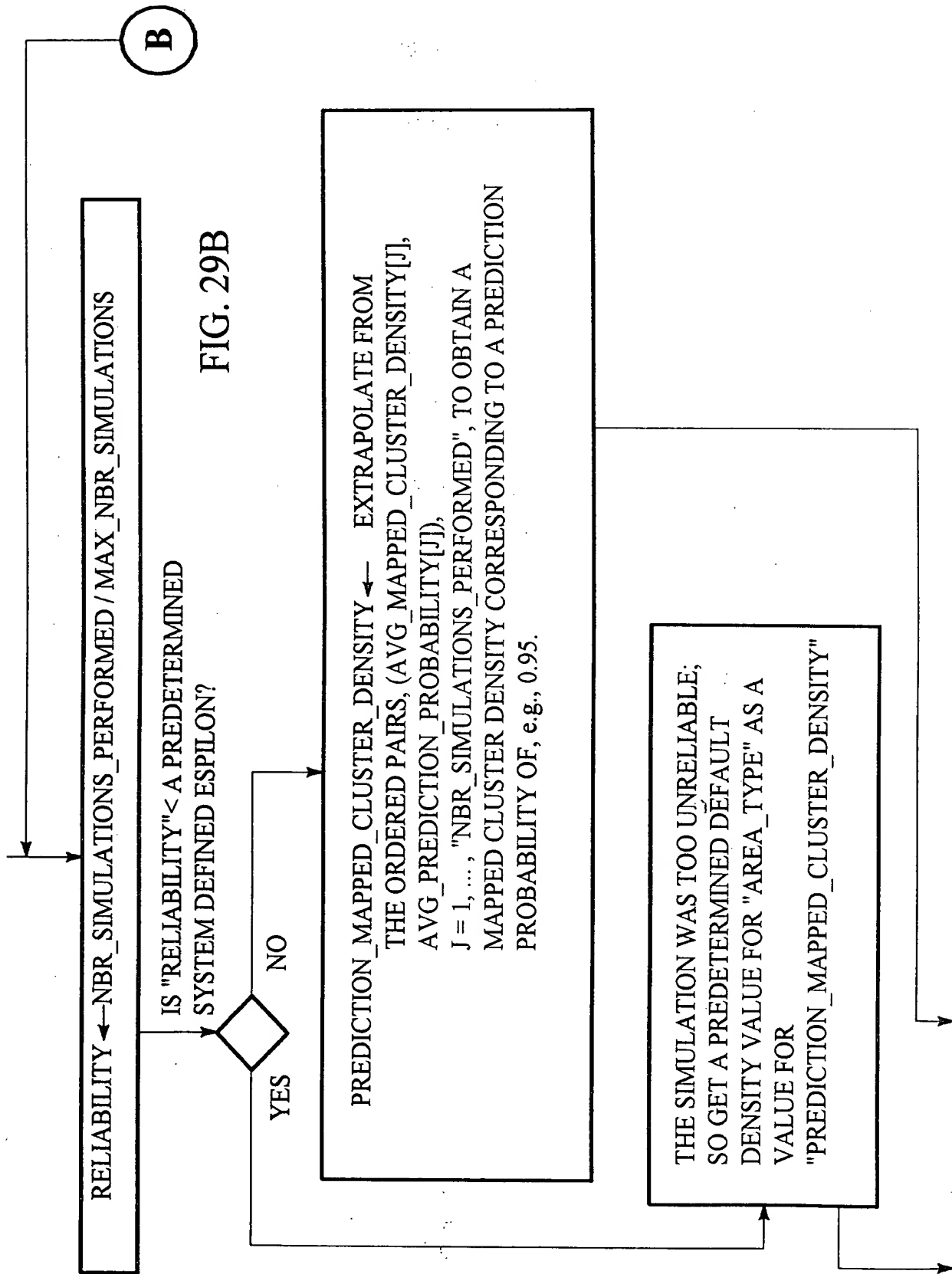


FIG. 29A



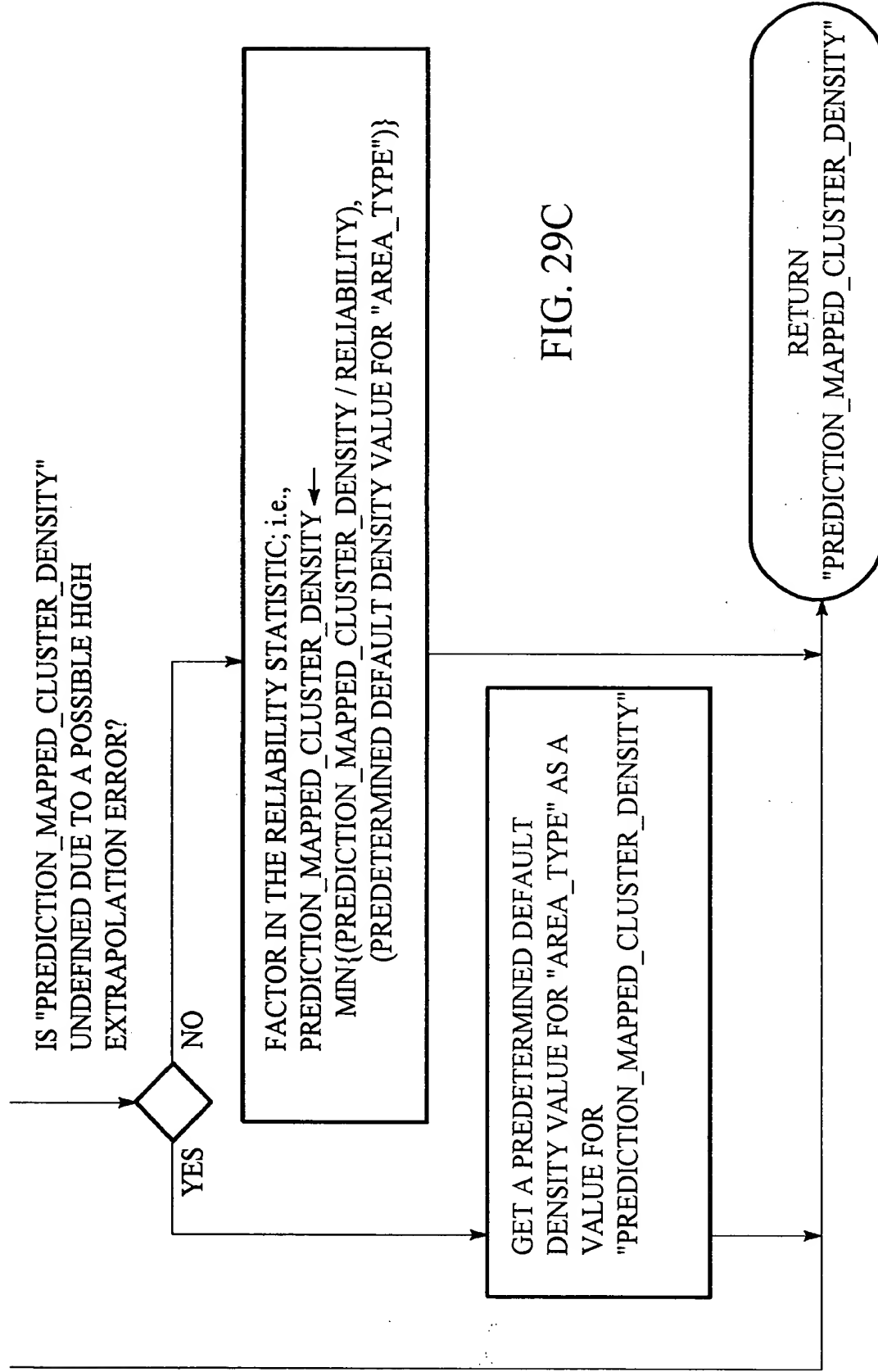


FIG. 29C

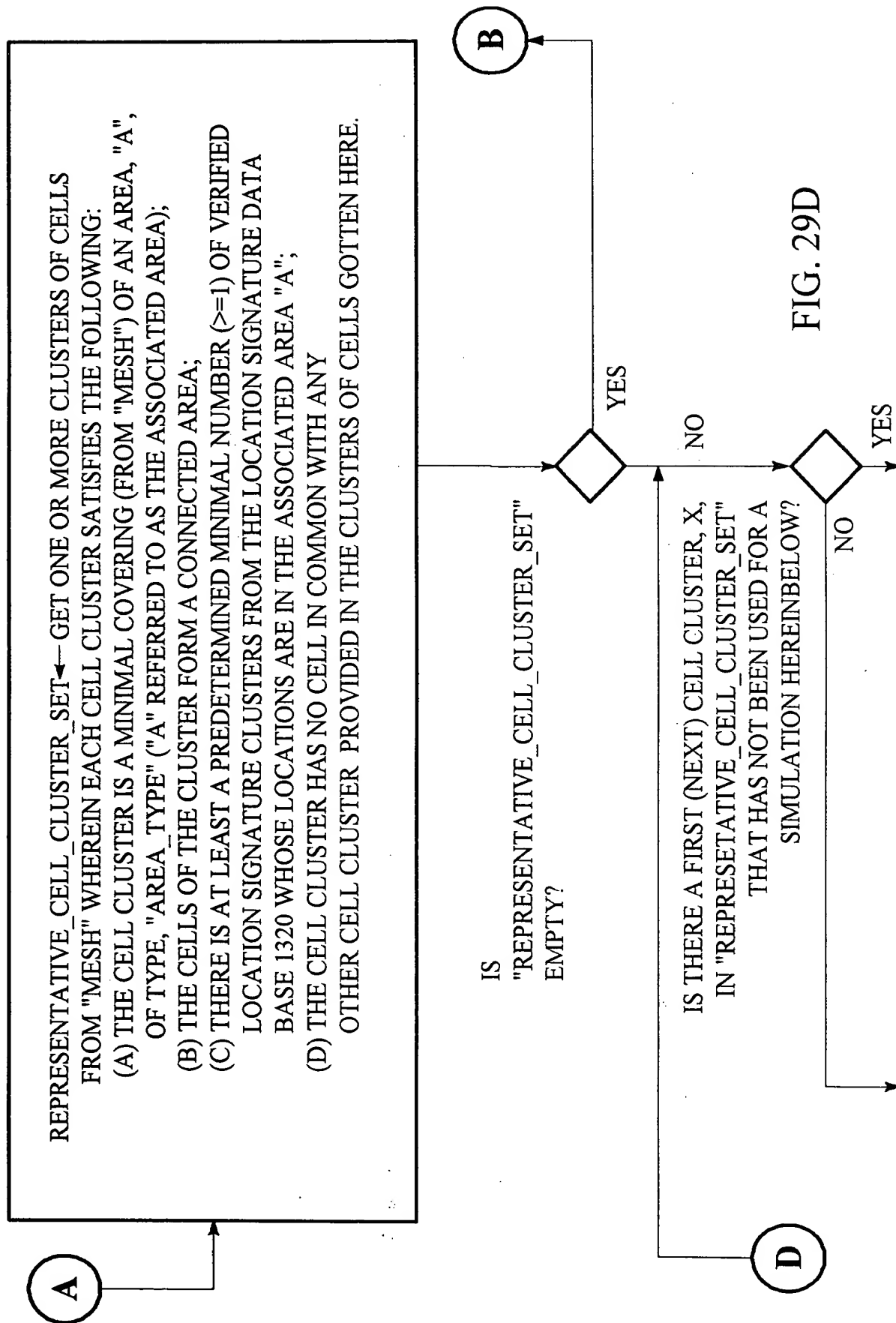
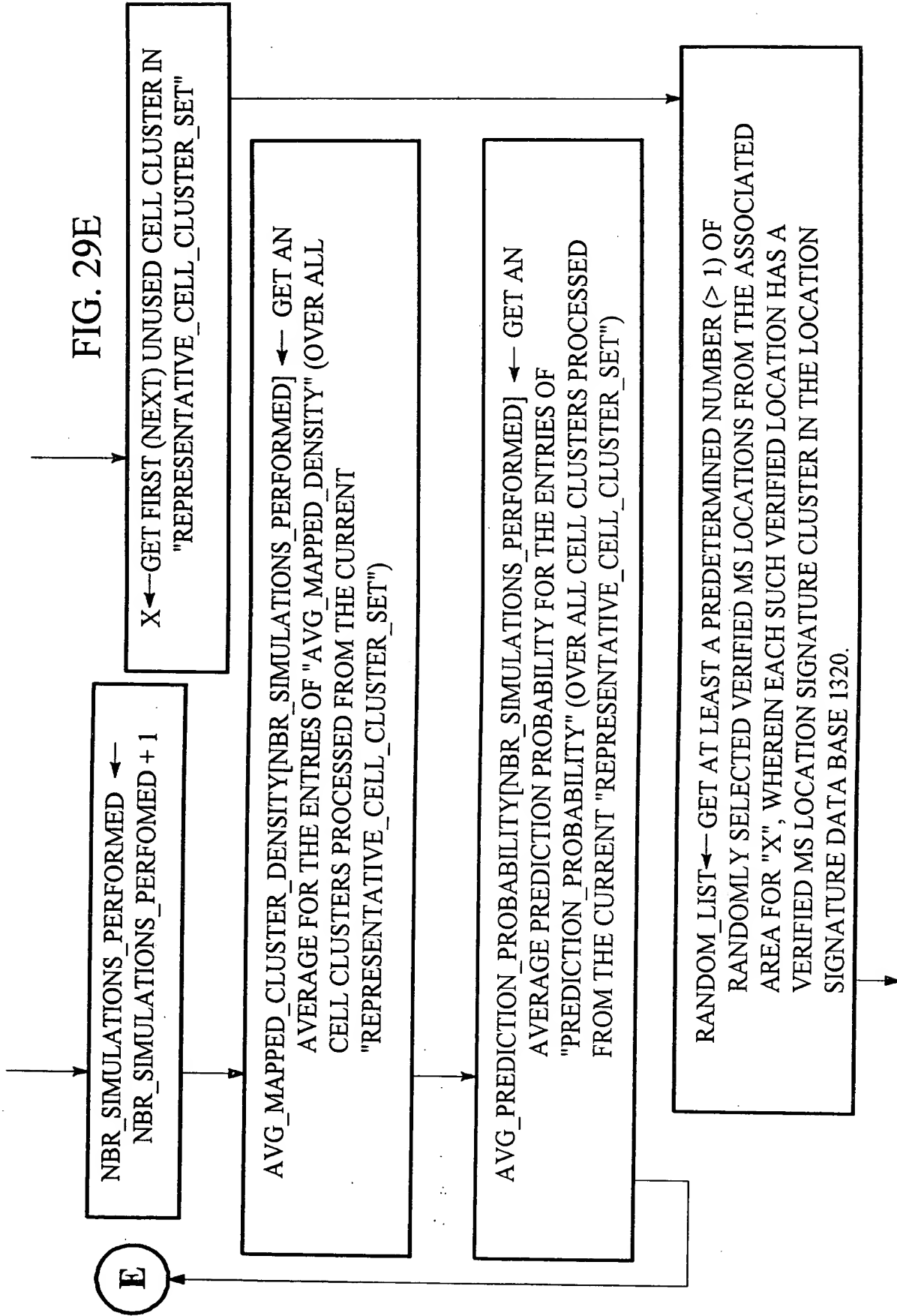
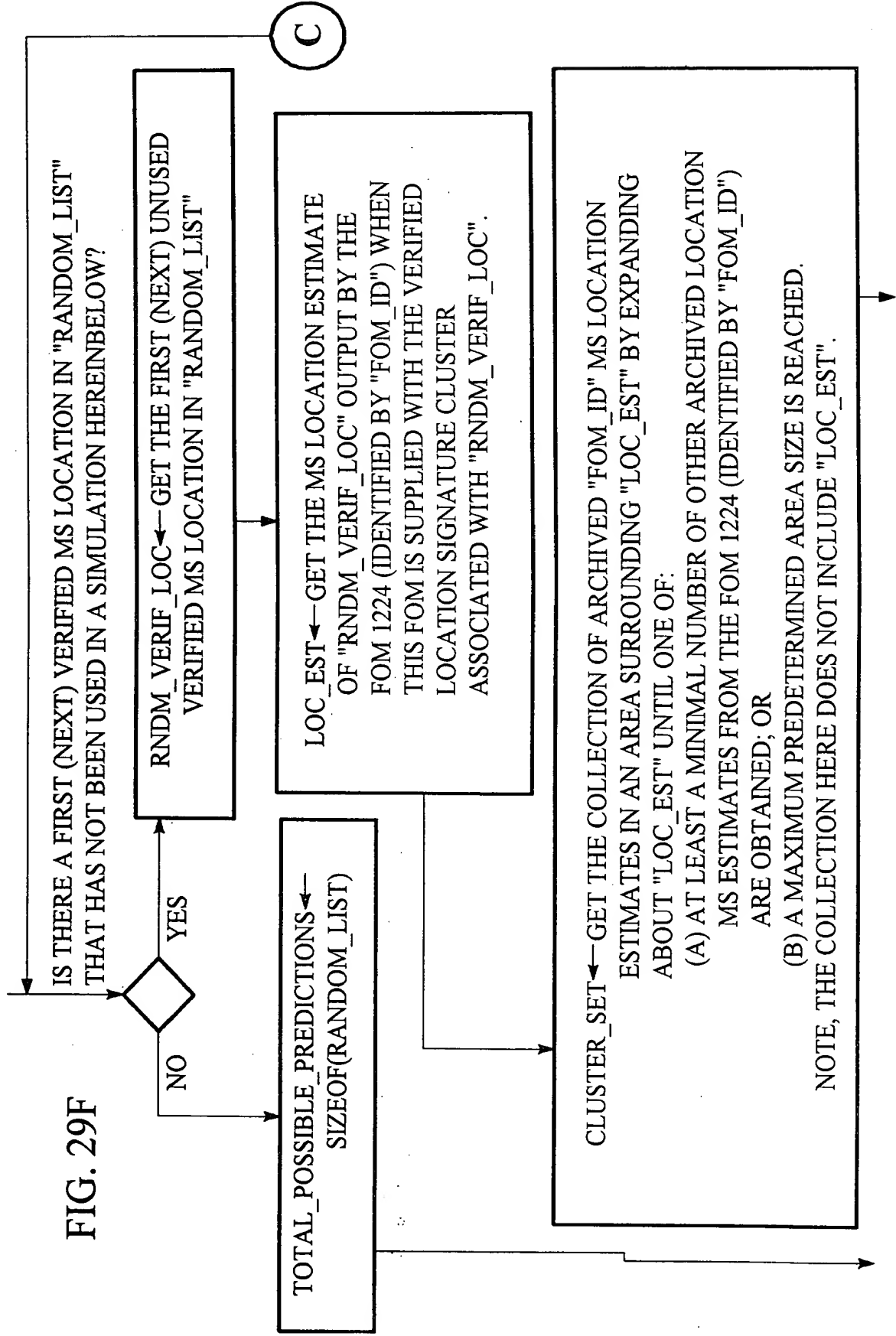


FIG. 29D

FIG. 29E





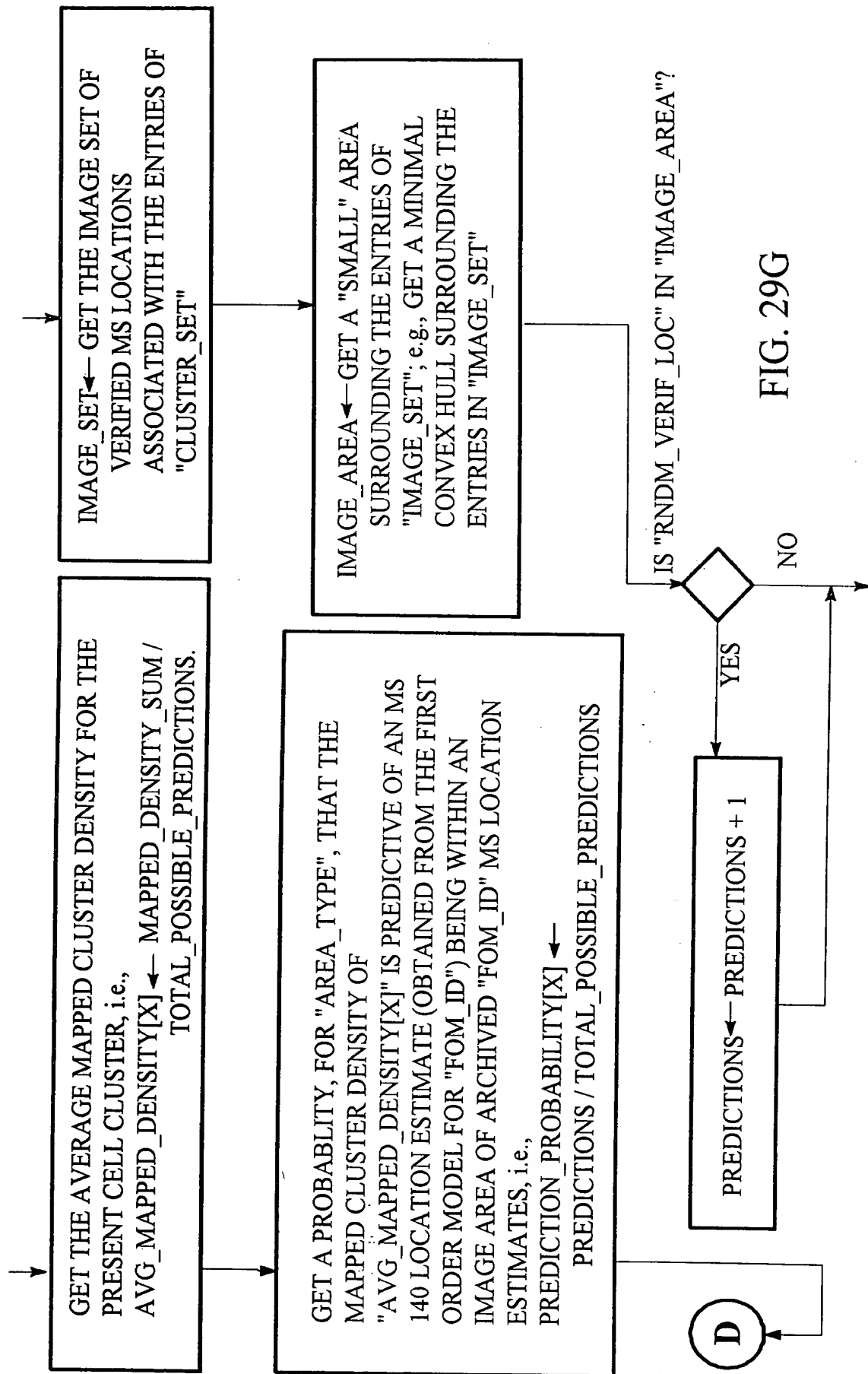
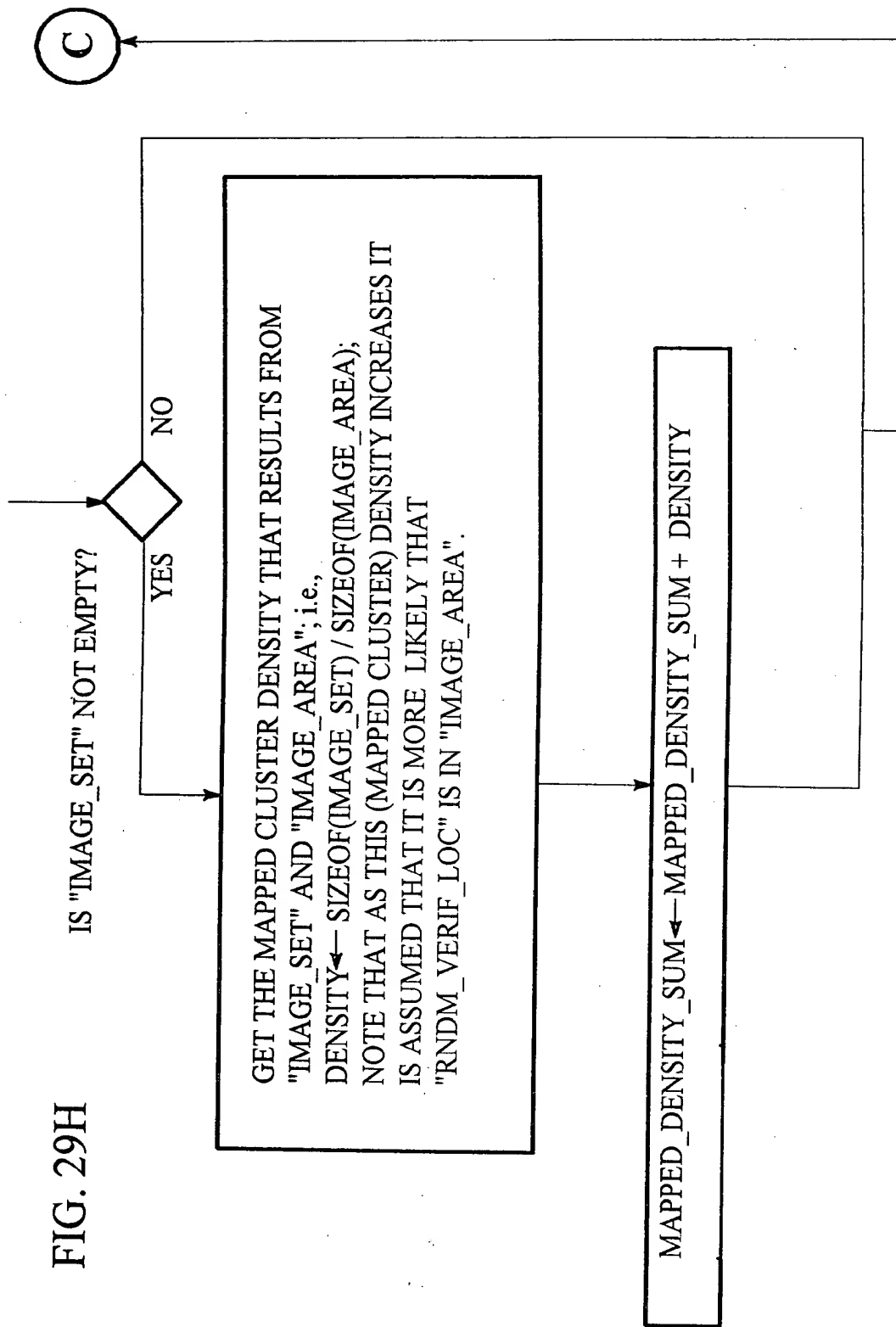
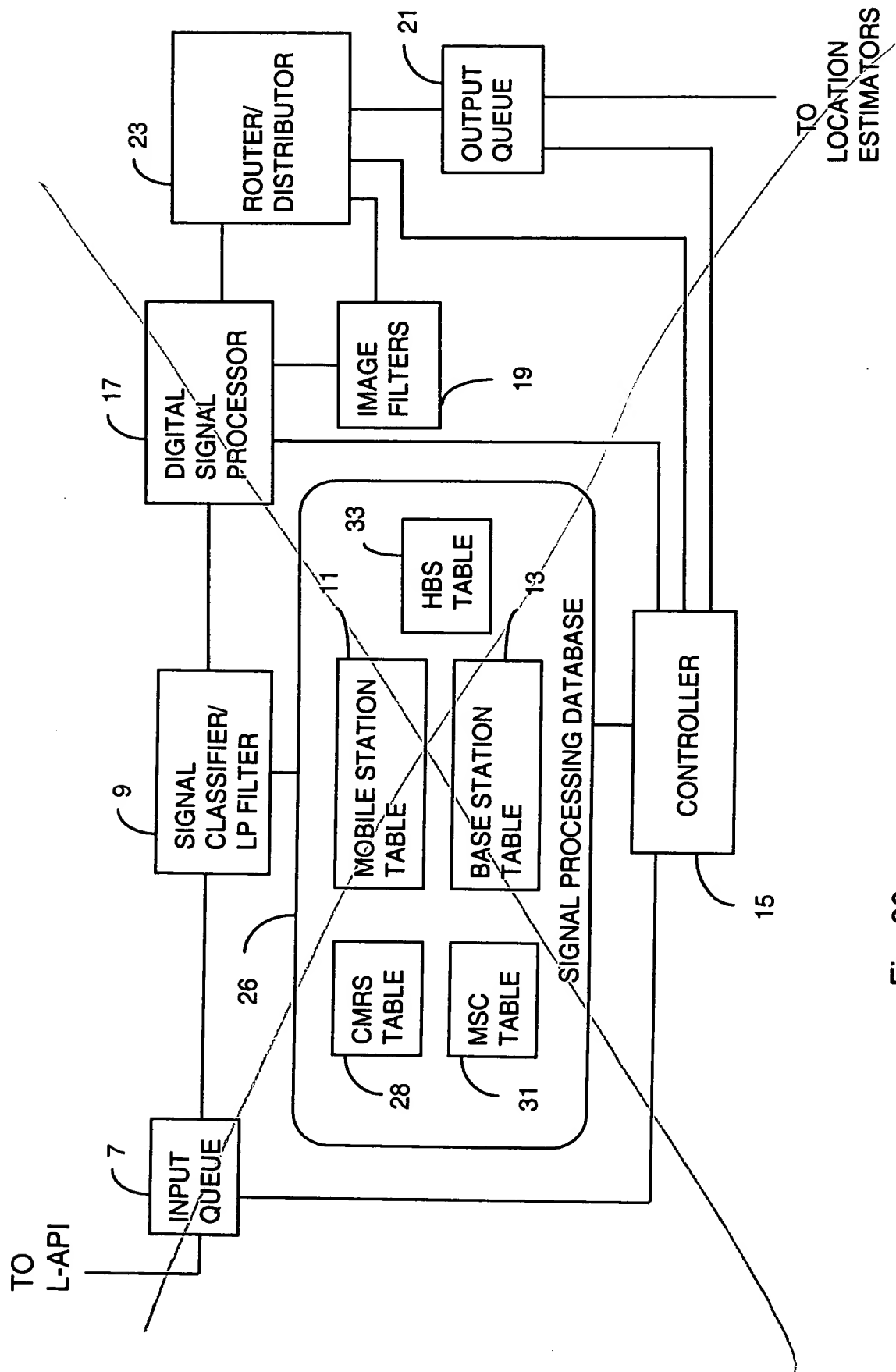


FIG. 29G





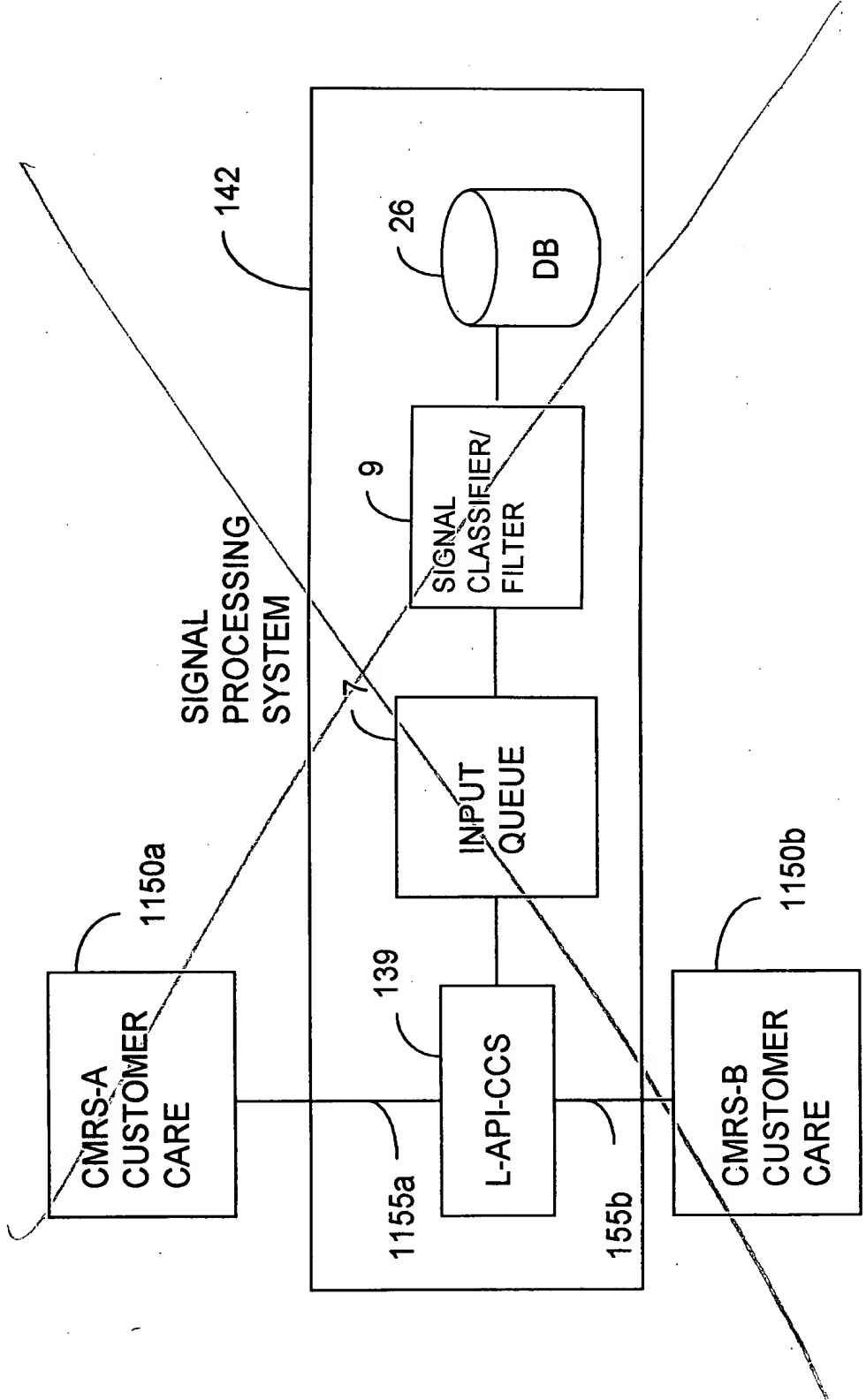


FIG. 31: